

PUBLIC WORKS

June
1951

CITY, COUNTY AND STATE

An Outline for Action for
Civil Defense

What You Should Know
About Painting
Water Tanks

Map Rack Makes Planning
Public Works Easier

Modern Equipment Cuts
Costs in Winchester

How Streets Were Re-
numbered in a Small City

How Equipment Serves
Cities—A Symposium



Devlin C. Green, Texas State Highway Engineer for the past eleven years and responsible for 37,000 miles of paved roads. More on page 29.

HUBER

A DEPENDABLE NAME IN . . .

ROAD MACHINERY

Dependability in road machinery is the result of many factors—such as sound design, use of the right materials and careful workmanship. The experience and general policy of the manufacturer are also important influences.

Since 1863, HUBER has had one policy—to build machinery that will do a sound job in the field. Not to meet a price nor outsell a competitor, but to do a job for the man who buys it.

The HUBER Maintainer has won wide acceptance as a 6,000 lb., 42½ H. P. Grader with attachments that permit year-round use in a variety of maintenance jobs. HUBER's complete line of rollers is known and used throughout the world. HUBER Motor Graders are doing important jobs—and doing them well.

For dependable road machinery, see your nearest HUBER Distributor.

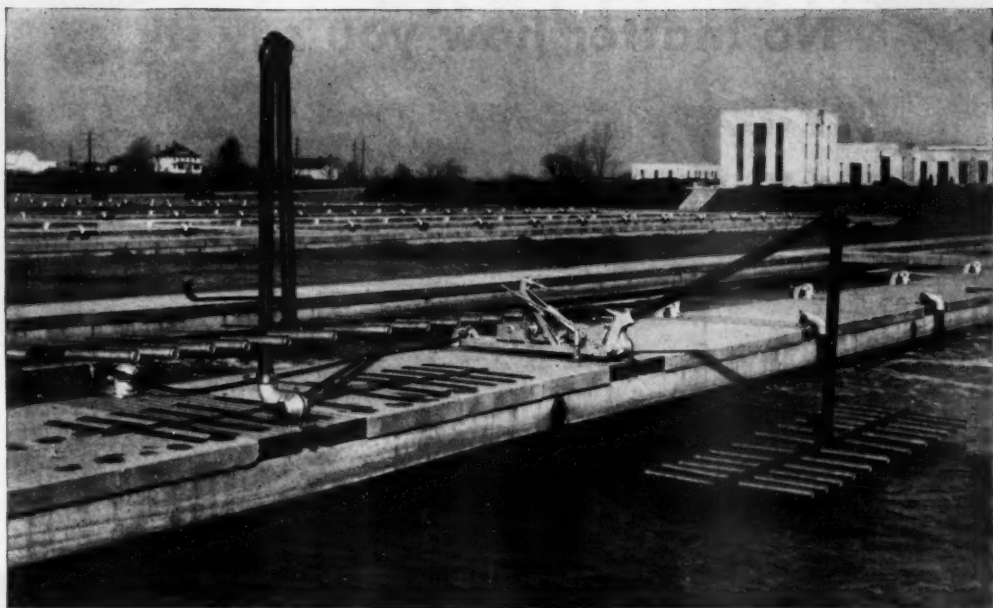


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MANUFACTURING COMPANY
MARION, OHIO, U. S. A. — Since 1863



MANUFACTURERS OF HUBER MAINTAINERS, GRADERS AND COMPLETE LINE OF ROLLERS



For Continuous Operation
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SWING DIFFUSERS AND PRECISION TUBES

It's good "Diffused Air Economics" to specify "Chicago" Swing Diffusers and Precision Diffuser Tubes. Precision Tubes are cleaned and restored to new condition easily and at a cost of only 10c per tube. Continuous operation of an aeration battery is possible only with Swing Diffusers, and the most economical operation is made possible by Precision Diffuser Tubes.

That's why most engineers who planned equipment for activated sludge sewage treatment plants in the past five years specified "Chicago" Swing Diffusers and Precision Diffuser Tubes.



Write for full engineering data.

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SEWAGE EQUIPMENT DIVISION

2300 WOLFRAM STREET

Flush Klean, Scrub-Peller, Plunger,
Horizontal and Vertical Non-Clogs
Water Seal Pumping Units, Samplers,



CHICAGO 18, ILLINOIS

Swing Diffusers, Stationary Diffusers,
Mechanical Aerators, Combination
Aerator-Clarifiers, Comminutors.

No matter how you say it
It Comes Out the Same
 Last Year—This Year—Next Year

in 1940
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A motor grader without power on the front wheels is like a horse with roller skates on his front feet.

in 1945
 we said

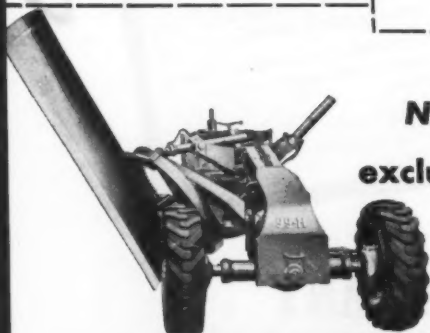


It's not in the cards for a grader with rear drive to equal the performance of one with All-Wheel Drive.

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Don't handicap your horsepower! No grader with a dead front end can possibly deliver maximum power-at-the-blade.



No two ways about it! Austin-Western's exclusive All-Wheel Drive goes more places... does more things... moves more material, farther and faster.

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BUILDERS OF ROAD MACHINERY
Austin Western
 SINCE 1897





PUBLIC WORKS Magazine

Edited by W. A. Hardenbergh and A. Prescott Folwell

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THE ENGINEERING AUTHORITY
IN THE CITY-COUNTY FIELD

Top-Tool FOR TOWNS



HT4 TRAXCAVATOR on Sanitary Landfill project—Thomasville, Georgia



Re-grading city street—Minneapolis, Minnesota



Loading out gravel from pit—Patagonia, Arizona

• **TRAXCAVATORS** are serving cities, towns, states and counties, countrywide proving themselves indispensable tools on Sanitary Landfills, in street departments and with maintenance crews.

Versatile, one-man operated, **TRAXCAVATORS** can handle every step at a Sanitary Landfill...digging trenches...spreading and compacting refuse...covering and grading the fill.

These powerful tractor-shovel team-mates of Caterpillar Diesel Tractors...grade new streets and sidewalks...dig and load out old pavement...clean-up and load

excess material...and maintain stockpiles.

Maintenance crews use the **TRAXCAVATOR** to dig and load gravel at the pit...in winter to speed snow removal...break through frost...at any time to backfill...spread and grade...dig...load...doze...remove trees, stumps and rocks.

In short, a **TRAXCAVATOR** will solve your equipment problems by doing dozens of jobs—eliminating investments in limited purpose machines. See your Trackson-Caterpillar Dealer now, talk over your needs with him or write **TRACKSON COMPANY**, Dept. PW61, Milwaukee 1, Wis.

TRACKSON

TRACTOR EQUIPMENT



Need more facts about advertised products? Mail your Readers' Service card now.

THE EDITOR'S PAGE



What Will Construction Cost in the Future?

LOOKING back over the past ten years, it is easy to see that a highway, a water supply or a waste disposal system built ten years ago has been a good investment because it cost then perhaps only half as much as it would cost to-day, or maybe less.

Right now a good many cities and counties are talking doubtfully about higher costs and are thinking about the return of the good old days when costs may be lower. What do the professionals think about the possibility of lower costs in the near future?

The chief engineer of duPont, which firm always is engaged in construction, estimates that costs will continue to increase over the next three years, about as follows: Lumber, up 3% a year; structural steel, up 3½% a year; cement, up 3% a year; and labor, up 5% a year. These increases will be on top of those we have already had. In essence, it means that we may look forward to about a 10% increase in costs of construction in the near future.

As we have said before, there is no better time in sight for needed public works construction than right now.

Materials for Water Supplies, Waste Disposal and Highways

IT seems that most everyone, excepting only those who are sitting on the materials and equipment lid in Washington, appreciates the vital necessity for providing needed materials for water supplies and waste disposal. So far, the situation has been most unsatisfactory, with little more than polite promises that such needs will be taken care of pending designation of a claimant agency to handle these functions. Representatives of these industries have discussed this matter with the Defense Production Administration without, at the time this is written, net profit.

Under modern conditions, preparedness, industry, housing and transportation are, essentially, one and the same thing. Water supply and adequate highways are essential factors in manufacturing; and so is housing and sanitation. With-

out water, manufacturing is impossible; without transportation, manufacturing is slowed down and the finished products cannot be delivered; without sanitation, manufacturing is slowed and too much of our effort is diverted to care for the sick; without housing, labor is unavailable or inefficient.

Now is definitely not the time to give up, to cancel plans for long-needed improvements affecting health, industry and prosperity, and to wait for peace on earth, sunshine and the good old times. Instead it is the time to get done those needed things that will make us better able to face an emergency if one should arise.

The Need for and the Supply of Engineers

STUDYING the heavy enrollment of engineering students three or four years ago, there was considerable concern that the engineering field would soon be overcrowded. The situation at this time indicates that a reverse situation is far more likely—in fact, almost certain. Right now engineers are in short supply and college enrollment is continuing its downward trend so far as engineers are concerned. It is likely that the present shortage is, in large part, due to the needs and activities of our defense program. Whatever the cause, it is unlikely that the next decade will see enough engineers to meet our full needs. The lost years of the war—lost so far as production of engineers was concerned—can not be made up. There is some question if to-day we have materially more engineers available than we had ten years ago. The passing years have taken their toll.

There is one way in which the profession can mitigate the seriousness of this lack of engineers. It can provide more and better planned in-service training programs for the younger men so that they may develop more quickly. And so that the development of the next older group may be more rapid, it will be necessary to place upon them greater responsibilities for making decisions and taking action. Sure, they will make mistakes; we all did; but that is the way to learn—and perhaps the only way.

An Important Message for Everyone Who Buys Sewage Treatment Equipment

From Single Items To Complete Sewage Treatment Plants INFILCO Equipment Can Fill ALL Your Needs

Thinking about replacing old equipment or modernizing and increasing the capacity of a sewage treating plant? INFILCO can provide a complete range of equipment and control devices from which to choose.

Planning an entirely new plant? INFILCO offers you the advantage of a one-source supply for all your needs. Whether your plans call for chemical or biological treatment, you can depend upon INFILCO for the most modern equipment available equipment that will be modern for years to come!

A complete laboratory and staff of competent engineers are available for making recommendations and reports.

When considering your next sewage treatment plant or the modernization of an existing plant—consider the advantages of Infilco Service and Equipment. The Infilco Field Engineer is only a telephone call away. Consult your Classified Directory or write our executive offices in Tucson.

SEND FOR 8-page Bulletin No. 60-C. It contains illustrated descriptions covering the many superior advantages of Infilco Sewage Treatment Equipment.

SERVING MUNICIPALITIES WITH SEWAGE TREATMENT EQUIPMENT THAT'S

*Quality Engineered for
Quality Performance*

INFILCO INC.

TUCSON, ARIZONA

WITH OFFICES IN PRINCIPAL CITIES

WORLD'S LEADING MANUFACTURERS OF WATER CONDITIONING AND WASTE TREATING EQUIPMENT

PRECISION ENGINEERED INFILCO SEWAGE TREATMENT EQUIPMENT

Accelerator®
Accelo-Biox®
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Accelo Hi-Cop® Filter Underdrain
Aero-spray Nozzles
Aero-Accelator
Automatic Dosing Siphons
Chemical Feeders
Clarifiers & Automatic Skimmers
Coagulators
Combination Grease & Grit Remover
Cyclator®
Digesters
Griductor®
Daytona Beach Process Plant
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Rotary Distributors
Sewage Samplers
Vortex Grit Remover
Vorti-Floc®
Vorti-Mix®
Vorti-Mix Aerators



It's a fact . . . our handy Readers' Service card is the easy way to get new catalogs.

TEXAS Pinch Hitter

Kerrville, Texas, picks International UD-24 for power in the pinches

The 10,000 people in Kerrville, Texas, have no water worries in case their main power source goes dead. An International UD-24 is always ready to take over.

Running a 1,000 GPM deep-well turbine pump, the UD-24 can supply the city's water requirements when other power is not available.

International Diesel and gasoline power units have saved the day many a time in many a city. You'll find them dependable in emergencies, and you'll be surprised at the way Internationals stand up in steady year-in, year-out service.

Have your International Industrial Distributor or Power Unit Dealer show you the International engines that will fit your job . . . and put International "Power that Pays" to work for you.

INTERNATIONAL HARVESTER COMPANY, CHICAGO 1, ILL.

TAKE OVER! That's the order of the day for this UD-24 stand-by water pump when an emergency occurs. City Engineer P. J. de Geuran gives the word, relies fully on his big red International.

INTERNATIONAL  **POWER THAT PAYS**

Thousands use our Readers' Service card to keep up to date . . . do you?

CINCINNATI IS WHIPPING THE HIGH COST OF BULK RUBBISH COLLECTION

Man-hours required for big tonnage collection cut 60 percent.

The City of Cincinnati gives Eight Reasons Why the Dempster-Dumpster System cuts bulk trash and rubbish collection costs and cuts work time from 2.43 man-hours to .98 man-hours per ton of material delivered to incinerator.

Recently a large Southwestern city, investigating the Dempster-Dumpster System of trash and rubbish collection, requested information from the City of Cincinnati on results obtained with the Dempster-Dumpster System. Here is the reply they received from Mr. Ralph C. Taylor, Superintendent of the Waste Collection Division, Department of Public Works.

"The City of Cincinnati Waste Collection Division has been using the Dempster-Dumpster System to augment its regular collection set up since 1948. Our experience since that time indicates that this system, utilizing the principal of large containers which can be left at rubbish accumulation points and easily picked up and carried to disposal point by a Dempster-Dumpster pick-up unit operated by the driver, is highly desirable. Our records indicate that the operation of these units require .98 man-hours per ton delivered to the incinerator as compared to 2.43 man-hours per ton needed in the operation of conventional pick-up with dump truck and crew.

"I have listed below some of the advantages of the Dempster-Dumpster System as we see them.

"1—These large heavy duty containers can be placed on the ground or in specially designed pits if so desired at the point of accumulation and loaded directly by the recipients of the service rather than placing the waste in some intermediate container. This eliminates rehandling by the collection forces in loading into standard collection units, a costly process.

"2—These containers offer a low loading height, making their application easy to any given situation.



AN APARTMENT TYPE detachable Dempster-Dumpster Container is shown above at accumulation point.



ONLY ONE MAN, THE DRIVER, is required in the Dempster-Dumpster System of municipal trash and rubbish collection. Driver is shown above attaching lifting chains to a drop bottom container. He will return to cab and from hydraulic controls hoist pre-loaded container into carrying position and drive to disposal area where materials will be dumped automatically.

"3—This system eliminates the idle time of trucks standing while loading at these points of large accumulations and eliminates lost labor time waiting for the trucks to return after its trip to the disposal area.

"4—The containers are of rugged construction and are practically indestructible. We feel that one of these containers over a period of time will cost less to buy and maintain than the refuse cans it replaces.

"5—Where necessary, leakproof containers may be used, eliminating the spillage of noxious wastes and the resulting unsanitary conditions.

"6—The rat nuisance is practically eliminated with this type of container and we have several outstanding examples where remarkable cleanups were made.

"7—Litter around the loading station is practically eliminated by the use of these containers. This is in outstanding contrast to stations using a great number of the conventional trash cans where the handling of lids and cans by the users usually results in overloading and improper covering.

"8—These detachable containers lend themselves readily to clean dumping at the disposal point. They can also be kept clean and sanitary with greater facility than the small container.

"At the present time in Cincinnati the Waste Collection Division is using these containers for both combustible and non-combustible wastes at the following type of institutions where large quantities of wastes are produced: Schools, Railroad Passenger Terminal (garbage from dining cars), Railroad Produce Terminal, Hospitals, Large Apartment Developments, Social Benefit Functions and Feasts, Circuses and Fairs."

Cities and towns everywhere are installing the Dempster-Dumpster System because no other method of bulk rubbish handling by truck can match the Dempster-Dumpster System in low cost of operation, efficiency, sanitation and good housekeeping! For a cleaner city and a lower budget, it will pay you to investigate the Dempster-Dumpster System. Write today for complete information. A product of Dempster Brothers, Inc.

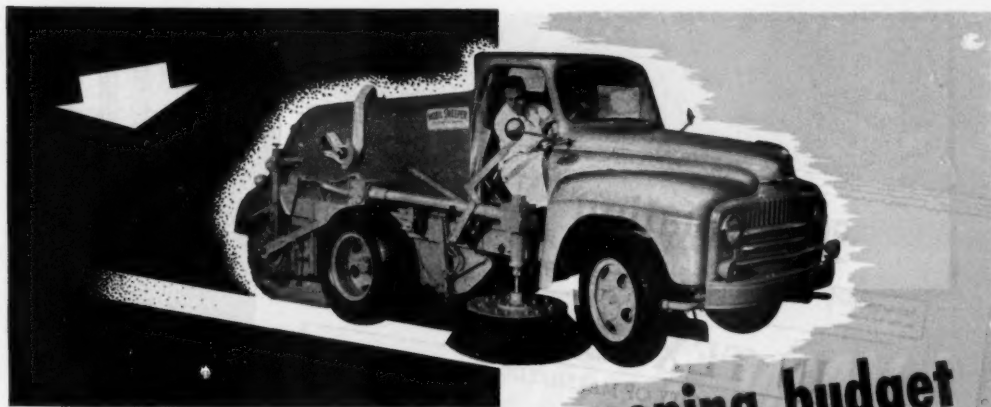


DEMPSTER-DUMPSTER Container with drop bottom dumping action is shown above as it begins to open hydraulically and discharge trash and rubbish.

DEMPSTER DUMPSTER

DEMPSTER BROTHERS
961 Dempster Bldg.
Knoxville 17, Tennessee

Now's the time to mail this month's Readers' Service card.



Balance your street sweeping budget with **MOBIL-SWEEPER**

You can keep your community happy with cleaner streets... *at lower cost.* Every budget is getting a closer check nowadays. Make sure you stay within yours by using the faster, more efficient Mobil-Sweeper.

Ten years of Mobil-Sweeper development brings you unsurpassed sweeping action. On streets, gutters, alleys, highways, parks and airports... even steepest hills, you get top sweeping performance.

Cleaner Sweeping is accomplished through the longer draught arms that make the rear pickup broom "full-floating" in the true sense. Deepest dips get a clean sweep where ordinary sweepers would skip over or drop refuse.

Gutters Are Swept More Thoroughly because the special "decreased arc" type gutter broom segments retain their flipping action longer, giving hundreds of extra miles of clean sweeping.

More Pavement Can Be Swept without stops because Mobil-Sweeper's big 200-gallon water tank provides spray for more pavement with fewer refills.

And Don't Be Fooled On Dirt Hopper Capacity... be sure that your sweeper fills to its rated capacity every time under normal operating conditions. Mobil-Sweeper fills its 2½ cu. yd. hopper to the overflow every time—that's what counts.



Maintenance Is Less Costly because the International Harvester engine lends itself to your standard maintenance.

It's The Safest Sweeper Built—Mobil-Sweeper protects the driver with shatterproof windshield, steel cab and 4-wheel hydraulic brakes. The low overall height and steel cab permit passage under low-hanging trees.

Write for details on how your community can save on street sweeping costs today!

MOBIL-SWEEPER

DIVISION OF
THE CONVEYOR CO.
3260 E. SLAUSON AVENUE
LOS ANGELES 58, CALIF.



THE CONVEYOR COMPANY
3260 East Slauson Avenue, Los Angeles 58, Calif.

P.W. 7

Gentlemen:

Please send catalog with complete details and specifications for the Mobil-Sweeper.

Name _____ Title _____

Address _____ City _____

County _____ State _____

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Fluoridation News

1945  1951

WALLACE & TIERNAN
611 First Street, New York

WALLACE & TIERNAN
611 First Street, New York
200-1234567

IN TEXAS, TOO —

CITY OF MARSHALL
MARSHALL, TEXAS

January 24th, 1951

A. W. SCHONHARDT
Water Superintendent

Wallace & Tiernan Co. Inc.
1112 National City Bldg.
Dallas 1, Texas

Gentlemen:

The City of Marshall, Texas began fluoridation of its municipal water supply in the Spring of 1946, under the jurisdiction of the Texas State Health Department. Marshall was the first city in the State of Texas to use fluoridation.

In February 1950, we changed our method of fluoridation by feeding sodium fluoride with a Wallace & Tiernan Type NA Dry Chemical Feeder.

We have found the Wallace & Tiernan Type NA Feeder to be simple in operation, easy to adjust and maintain, and extremely accurate for feeding sodium fluoride. We have been able to hold the fluoride content of our treated water very constant by using this feeder.

We would be glad to recommend this feeder to any town considering adding fluorides to the public water supply.

Very truly yours,

CITY OF MARSHALL
J. W. Schonhardt
J. W. SCHONHARDT
Water Superintendent

When *your* community is ready to look into fluoridation — and after you have consulted your State Department of Health — you'll find W&T Engineers ready and willing to help you.

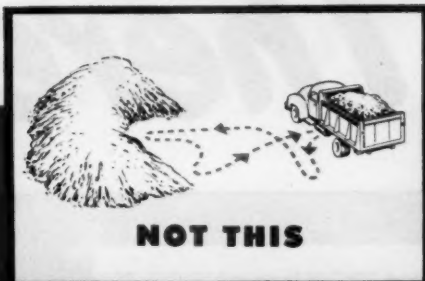
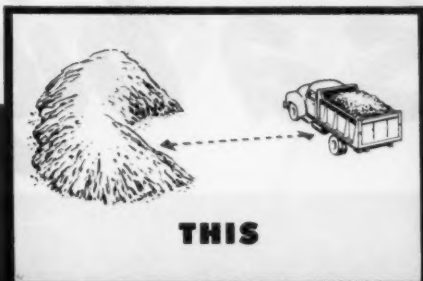
WISCONSIN

WALLACE & TIERNAN
COMPANY, INC.

CHLORINE AND CHEMICAL CONTROL EQUIPMENT
NEWARK 1, NEW JERSEY • REPRESENTED IN PRINCIPAL CITIES

Today over 30 W&T install

It's a fact . . . our handy Readers' Service card is the easy way to get new catalogs.



*...is the **PROFIT WAY!***



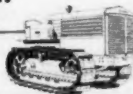
You cut out costly loading "detours"... save time and effort... with an Oliver Industrial Wheel Tractor and Strait-Line Loader. This revolutionary hydraulic, double end tractor-loader can load either in front or rear... dump in front. The operator can load and dump without twisting or turning the tractor... travel a *straight line* between pile and truck.

Rear-end digging gives you far more loads with far less effort. "Push-Tilt" bucket with penetrating lips gives you a bigger load every time.

With bucket carried in the rear, *and low*, additional traction is created, assuring far greater mobility and maneuverability in any kind of going. Rear-carried bucket puts increased load on rear wheels for increased traction... lightens load on front wheels for far easier steering.

Investigate the Oliver—Strait-Line for your operations. Your Oliver Industrial Distributor will give you the complete details. Or, write The Oliver Corporation, Industrial Division, 19300 Euclid Avenue, Cleveland 17, Ohio.

THE OLIVER CORPORATION
A complete line of industrial wheel and crawler tractors



It's a fact... our handy Readers' Service card is the easy way to get new catalogs.

There's a big

This tough "Cat" D7 Tractor with "Cat" No. 7S Bulldozer is refining and widening 1½ miles of Panoche Road in San Benito County, California. Even the most rugged slugger must be kept in top condition to "go the distance." With the developing shortages, preventive maintenance is more important than ever before.



IF YOU WANT TO HELP YOUR COUNTRY— AND YOURSELF AT THE SAME TIME— READ EVERY WORD ON THESE TWO PAGES

Keeping equipment *on the job* is of prime importance today—to the nation as well as to you. There are nearly 3,000,000 miles of road to be maintained by state and county highway departments. And it takes 37 pieces of equipment to maintain each 1,000 miles of state highway—19 pieces to maintain each 1,000 miles of county highway. Plainly, this communications network is of vital importance to the defense effort.

Right now there is a shortage of materials with which to build urgently needed machines and parts. Military and Defense Rated Orders get the nod over unclassified civilian needs. Steel and other materials are in short supply. This means that you—with our help—must get every last machine-power hour out of the equipment and parts you now have.

Down-time will not only weaken the defense effort, it can put you in the hole. On all counts our program of public works cannot be neglected due to a shortage of machines *on the job*. Roads bind cities, towns, states to their neighbors—in an emergency, they become important dispersal and supply routes. Block these arteries of com-

munication a little, and you slow down production for defense a lot!

So to stay in business profitably, and help America arm for defense, do these things now:

- 1 Use equipment properly. "Cat" machines are built for hard use—not abuse.
- 2 Give extra attention now to preventive maintenance (see next page).
- 3 Discuss your parts needs and maintenance problems with your "Caterpillar" dealer. His maintenance responsibility begins where your operators' and mechanics' responsibility ends. He has the skilled servicemen and equipment to rework and rebuild worn parts to keep your machines on the job longer.

CATERPILLAR TRACTOR CO. • PEORIA, ILLINOIS



The last war showed the Military that "Cat" Earthmoving Equipment was as important to defense and offense as tanks. Here Sgt. Robert Chrisman operates a "Cat" D7 Tractor with matching blade on Davison airstrip at Ft. Belvoir, Va.

job ahead!

You're

the

Doctor

Today no owner can afford to think of direct costs alone. Good care of equipment can mean the difference between a producing machine and one laid up for repairs. To see how good care can save many hours of equipment life, reread your Operator's Instruction Book often and follow these suggestions.



• DUST

Think of dust as Machine Enemy No. 1. A few grains today—a few more tomorrow—and soon the result adds up to serious wear. Dust or dirt plugged breathers or air cleaners—use of dirty oil containers—loose intake manifolds—loose inspection covers—dirty clutch compartment—failure to wash flywheel clutch compartment—worn seals on crankshaft—defective gaskets—failure to clean oil filter openings . . . these are some of the vulnerable spots.



• TRACK ASSEMBLY

Don't let abusive use or neglect cripple the service life of your track assembly. Track adjustment and lubrication of rollers, carrier rollers and idlers are your job. Before excessive wear occurs on grouseers, links, pins, bushings, idlers, rollers and sprockets, call in your "Caterpillar" dealer. He can build up grouseers, rollers, idlers and links, and replace sprocket rims and turn pins and bushings so you will have many additional hours of service.



• CYLINDER HEADS

Prevent cracked cylinder heads by avoiding overheating, freezing, scale deposits, filling a hot engine with cold water, pulling heads down too tight, and other poor maintenance practices. Your "Caterpillar" dealer can repair most cracked cylinder heads. He can replace worn valve seats with valve inserts and restore the rocker arm mechanism to serviceable limits. Consult your Operator's Instruction Book for proper cooling system and valve care.



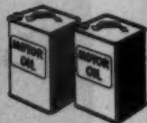
• COOLING

Don't let your engine overheat. Keep the cooling system free of scale, rust and sediment. Use soft or treated water, and when freezing temperatures exist, protect your engine with anti-freeze. Clean the radiator regularly with chemical flushing solutions. Remove foreign matter from the core by brushing or washing. Prevent engine troubles which come with overheating. Consult your Operator's Instruction Book for proper cooling system care.



• LUBRICATION

Careful lubrication practices will add much to your satisfaction through equipment performance, economy and long life. Use only recommended lubricants, changing the lubricant at proper intervals. And use only "Caterpillar"-proved filter elements. Remove dirt from fittings and clean around the crankcase filler cap before adding oil. A little care saves many hours of engine life. Consult the lubrication chart in your Operator's Instruction Book.



• PISTONS AND LINERS

Almost all the piston wear occurs in the upper ring groove. Your "Caterpillar" dealer can renew your pistons by machining the upper ring groove for a wide ring, many sizes of which are chrome plated. Worn liners can be deglazed and put back to work for many additional hours of service life. Consult your Operator's Instruction Book for information on lubrication and the oil cooling system.

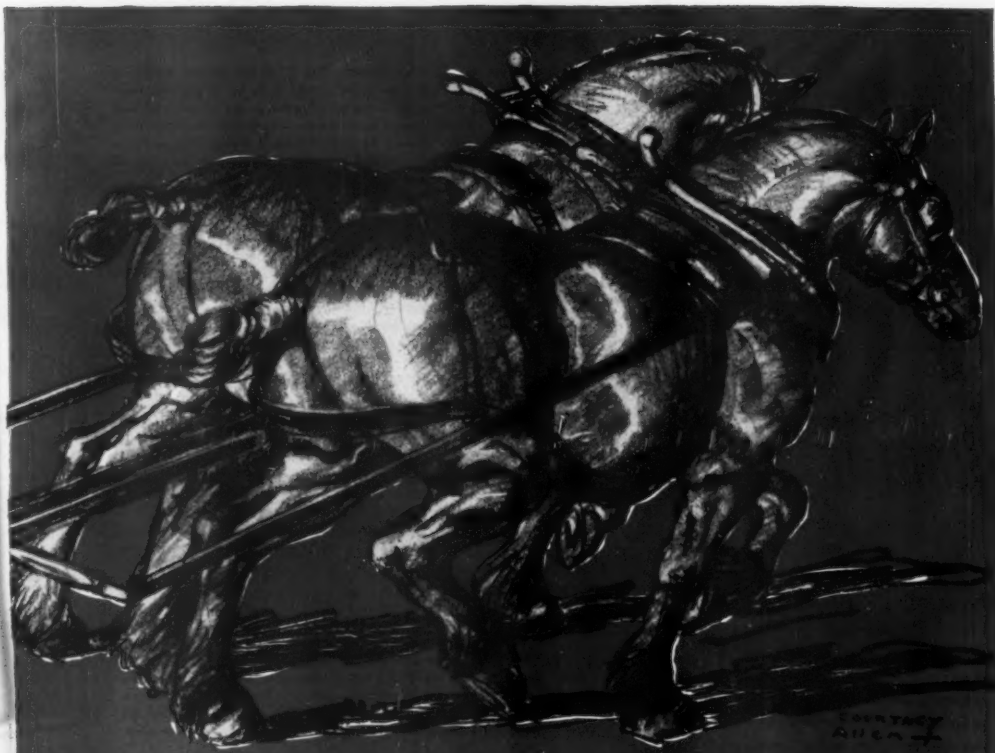


CATERPILLAR

REG. U. S. PAT. OFF.

DIESEL ENGINES • TRACTORS • MOTOR GRADERS • EARTHMOVING EQUIPMENT

STRENGTH is vital



**Like a Belgian draft horse
cast iron pipe is known for strength**

Be doubly sure when you specify pipe for mains to be laid under city pavements. Sure that it effectively resists corrosion. Sure, also, that it has the four strength factors, listed opposite, that pipe must have to withstand beam stresses, external loads, traffic shocks and severe working pressures. *No pipe, deficient in any of these strength factors, should ever be laid in*

paved streets of cities, towns or villages. Cast iron water and gas mains, laid over a century ago, are serving in the streets of more than 30 cities in North America. These attested service records prove that cast iron pipe not only assures you of effective resistance to corrosion but all of the vital strength factors of long life and economy.

Need more facts about advertised products? Mail your Readers' Service card now.

in pipe for city streets

No pipe that is deficient in any of the following strength factors should ever be laid under paved streets.

CRUSHING STRENGTH

The ability of cast iron pipe to withstand external loads imposed by heavy fill and unusual traffic loads is proved by the Ring Compression Test. Standard 6-inch cast iron pipe withstands a crushing weight of more than 14,000 lbs. per foot.

BEAM STRENGTH

When cast iron pipe is subjected to beam stress caused by soil settlement, or disturbance of soil by other utilities, or resting on an obstruction, tests prove that standard 6-inch cast iron pipe in 10-foot span sustains a load of 15,000 lbs.

SHOCK STRENGTH

The toughness of cast iron pipe which enables it to withstand impact and traffic shocks, as well as the hazards in handling, is demonstrated by the Impact Test. While under hydrostatic pressure and the heavy blows from a 50 pound hammer, standard 6-inch cast iron pipe does not crack until the hammer is dropped 6 times on the same spot from progressively increased heights of 6 inches.

BURSTING STRENGTH

In full length bursting tests standard 6-inch cast iron pipe withstands more than 2500 lbs. per square inch internal hydrostatic pressure, which proves ample ability to resist water-hammer or unusual working pressures.



CAST IRON PIPE RESEARCH ASSOCIATION, THOS. F. WOLFE, MANAGING DIRECTOR, 122 SO. MICHIGAN AVE., CHICAGO 3.

CAST IRON PIPE

SERVES FOR CENTURIES

Get full details of this month's new products . . . mail your Readers' Service card today.

For low flow . . . for storm conditions
TRITOR SCREEN
 efficiently removes screenings and grit



City of Kirksville, Mo., employs a Link-Belt Tritor Screen at each of two sewage treatment plants. J. W. Shikles & Co., Kansas City, Mo., Consulting Engineers.

LINK-BELT combines bar screen and grit chamber in one economical unit

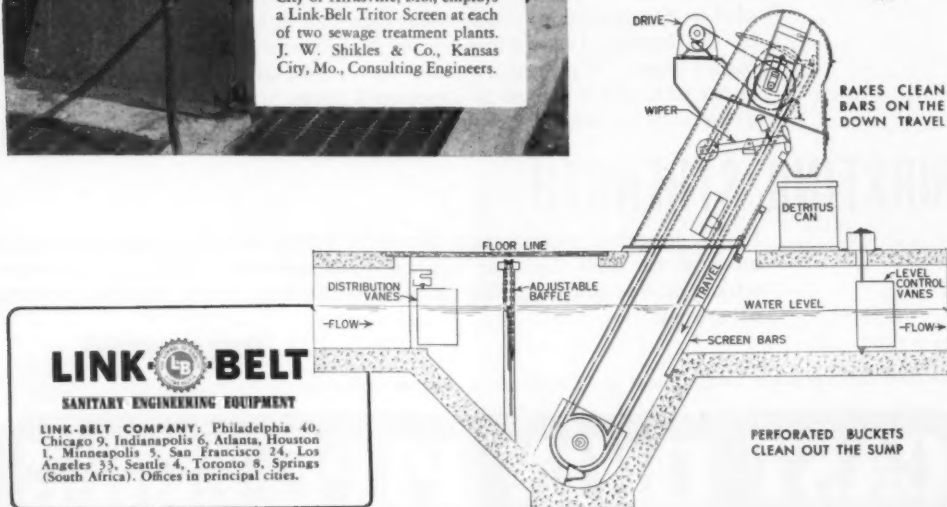
OVER 70 small and medium size treatment plants enjoy the savings provided by the Link-Belt Tritor Screen.

It combines the functions of a mechanically cleaned bar screen and grit chamber in a machine that is economical and easy to install. Used ahead of comminutors or screening shredders, the Tritor removes large solids to reduce wear on cutting parts. Two adjustable baffles provide velocity control for minimum flows.

When Tritor Screens are installed in conjunction with screening shredders, screenings may be shredded and returned to the sewage flow during periods of low flows when no grit is coming to the screens.

For details on Tritor Screens and other equipment in the broad Link-Belt line, call the office near you. A Link-Belt sanitary engineer will be glad to give you complete information.

12,427



LINK-BELT
 SANITARY ENGINEERING EQUIPMENT

LINK-BELT COMPANY: Philadelphia 40, Chicago 9, Indianapolis 6, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa). Offices in principal cities.

It's a fact . . . our handy Readers' Service card is the easy way to get new catalogs.



New TRUCK LOADER

**SAVES USERS Time-
Manpower-Equipment**

**CUTS COST
of STREET
and HIGHWAY
MAINTENANCE**

THE NEW Holmes-Owen Loader offers a very practical solution to the problem of today's increasing cost, on street and highway maintenance jobs. The installation of a self-loader reduces the cost of such operations for with this driver-operated unit, one man now does the work of several. The versatile one-man operation of a loader-equipped truck, not only speeds up material handling but substantially reduces the cost per ton handled. It saves time, labor and equipment by permitting the truck driver to do his own loading, hauling, and unloading without extra help or the use of more costly equipment. The new truck loader is today being profitably used by states, municipalities, contractors and numerous commercial and industrial firms. Write factory today for details on this unit which is unsurpassed for handling stock pile materials, snow removal, cleaning-up and dozens of other practical uses.

Manufactured by
Makers of HOLMES WRECKER Equipment

ERNEST HOLMES COMPANY
Chattanooga, Tennessee

**Permits DRIVER to
LOAD, HAUL, DUMP,
Do Light DIGGING,
Grading, Cleaning-up**



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Johns-Manville

Now's the time to mail this month's Readers' Service card.



tax savings for the future

Three billion, two hundred and fifty million dollars*—that's what it will take to foot the bill for new water system construction so urgently needed by the American people during the next ten years!

For the thousands of communities that must carry a share of this additional investment, the vital need for water system expansion is most unwelcome at this time in the face of constantly rising costs.

This means that, wherever possible, water works officials will be called upon to keep an exceptionally close watch on expenditures . . . to see that the money laid out for new systems brings the greatest possible return to the taxpayer.

Since a sizable part of the cost of any water system involves the supply and distribution lines, an important question to be answered by these officials will be: "Which pipe will give the greatest return from this portion of our investment?"

Thousands of communities have already found the answer to this question in Transite Pressure Pipe.

A threefold warranty of economy is built into every length of Transite Pressure Pipe . . . the modern pipe

developed by Johns-Manville through research and engineering to carry water more efficiently:

1. Long service life . . . because Transite Pipe is made of three inherently corrosion-resistant materials—*asbestos, cement and silica*—and is steam cured under pressure by a special Johns-Manville process which assures *maintained strength in service*. Carefully kept records of performance in highly corrosive soils prove that conditions which seriously weaken other pipe materials have little effect on Transite.

2. Low operating costs . . . because Transite Pipe has a smooth interior surface which provides a high water-carrying capacity ($C=140$). Moreover, because Transite cannot tuberculate, this high carrying capacity *remains* high through the years. Pumping costs, as a result, stay low. Delivery of a full volume of water at lowest operating cost is assured.

3. Maximum water economies . . . because Transite Pipe has tight, yet flexible joints that *stay* tight in service. These joints absorb vibration and soil stresses, cut down on costly underground water leakage. This is especially important today when water supplies in many localities must be conserved to the limit to meet constantly increasing water consumption.

In addition to these assurances of tax savings for the future, Transite Pressure Pipe offers many *immediate* economies, such as important savings in time and money during installation . . . further sound reasons why it will pay you and your community to specify Transite for the greatest return from your pipe investment.

*From THE WALL STREET JOURNAL, May 26, 1950

For complete information write Johns-Manville, Box 290, New York 16, N. Y.

TRANSITE PRESSURE PIPE

Transite is a registered Johns-Manville trade mark.
Need more facts about advertised products? Mail your Readers' Service card now.



Preferred power on orchard sprayers and other orchard equipment — the world's most widely used single-cylinder gasoline engines on machines and tools for industry, construction, railroads, oil fields, etc., and on appliances and equipment for farm and home.

THIS TRADE-MARK is your guide to all that is best in 4-cycle, single-cylinder, air-cooled gasoline engine performance. Briggs & Stratton Corporation, Milwaukee 1, Wis., U.S.A.

In the automotive field Briggs & Stratton is the recognized leader and world's largest producer of locks, keys and related equipment.

Get full details of this month's products . . . mail your Readers' Service card today.

LETTERS

TO THE
Editor

OUT OF THE SNOW

I have come down here to act as engineering consultant and superintendent of filtration for the new filter plant of the City of Guayaquil. I expect to have a flock of new colored slides and new yarns when I get home again. That is expected to be about 2 September. I left Iowa City just in time to miss the heaviest snowfall in 51 years (28 ins. in 90 hours). This has been a long, tough winter in Iowa. I am not now planning to attend the AWWA meeting in Miami, so I shall be looking forward to hearing all about it.

Jack J. Hinman, Jr.,
Casilla No. 1305,
Guayaquil, Ecuador.

JOBS FOR ENGINEERS

I am writing to ask if you might be able to put us in touch with any mechanical and industrial engineers and price analysts interested in Civil Service positions with the Chemical Corps. The vacancies cover positions up to grade GS-12 and we are looking for engineers in the above fields who have had some practical experience.

James H. Defandorf,
Colonel, Chemical Corps,
Room 2743, Building T-7,
Gravelly Point, Washington 25, D. C.

Ed Note: If interested, please contact Col. Defandorf direct without reference to this office, supply an outline of information on training and experience, and ask for application forms.

AVOIDING CHLOROPHENOLS

Due to the industrial wastes in Lake Michigan water, Hammond has been troubled, two or three times each winter over the past years, with a medicinal taste in its drinking water. The people of Hammond, having become accustomed to drinking water with a threshold odor of one or two, really made the telephones ring when they tasted the chlorophenols. This required action.

Our present method of control is based on a suggestion of David C. Colebaugh, chemist for the West Virginia Pulp and Paper Co. He

Walks readily through loose backfill sand above newly-laid sewer.



There's plenty of traction and flotation to wade through mud too.

Four-Wheel Drive **PAYLOADER** *On Rubber Tires*

This big 1½ yd. Model HM PAYLOADER with its combination of large pneumatic tires and 4-wheel drive gives you fast-action traction on all kinds of footing—on sand, stone, snow, clay or mud. It gives you crawler-like traction at far less maintenance expense . . . speed when you want it . . . the ability to work on pavements. It travels over streets and highways without using a trailer.

This special tractor-shovel also provides easy operation and maneuvering speed through its power-assisted steering and full-reversing transmission. There are four speeds in reverse as well as forward. Double-acting hydraulic rams raise and lower the booms . . . dump and close the bucket . . . exert tons of down-pressure for tough digging conditions.

See a Model HM in action and you'll know why hundreds of contractors and road and street departments are enthusiastic owners and boosters. The Frank G. Hough Co., 761 Sunnyside Avenue, Libertyville, Illinois.



Literature on the big 1½ yd. Model HM and six smaller PAYLOADER sizes, down to 12 cu. ft. bucket capacity, is yours for the writing.



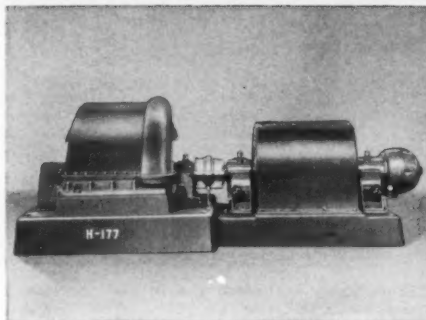
PAYLOADER®

THE FRANK G. HOUGH CO. • Since 1920



Get full details of this month's products . . . mail your Readers' Service card today.

Take no chances on V-P-L



One of three, Type H, 3-Stage Centrifugal Blowers in a metropolitan sewage treatment plant. Capacity 15,000 cfm. Other plants in this same city are also equipped with R-C units.

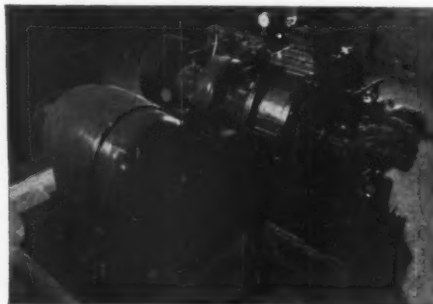
V for Volume—P for Pressure—L for Low power cost.

Those are three essentials for adequate blower performance. You're sure of all three, with Roots-Connersville Blowers and related equipment.

That's the case whether your plant calls for Centrifugal or for Rotary Positive units. You can have either type, from the exclusive R-C dual-ability line. Capacities range from 5 cfm to 100,000 cfm, thus permitting the selection of a size closely matched to your specific demands. Frequently, this freedom of choice saves time, cost, space, weight and power.

R-C engineers will gladly help you select the right blowers with the V-P-L needed to provide reliability and economy.

ROOTS-CONNSVILLE BLOWER CORPORATION
510 Poplar Avenue, Connersville, Indiana



R-C Rotary Positive Blower in sewage treatment service in a small midwestern city. Capacity 600 cfm.

ROOTS-CONNSVILLE

ONE OF THE DRESSER INDUSTRIES



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recommended that we change our point of application of chlorine from near the pumps to one of the mechanically equipped mixing basins. He reasoned that the normal point of application caused the formation of chlorophenols before the carbon was applied and therefore did not give the carbon a chance to remove the phenols present in the raw water. This suggestion was happily followed and additional facilities were provided for use when phenols became a problem. Since varying amounts of phenols enter our plant, the operators have been instructed to follow a carbon feed table with a 3 to 1 ratio over normal carbon feeds. When higher phenol concentrations are present, carbon dosage may exceed this table.

We normally use 300 pounds of chlorine daily to carry an 0.8 ppm residual leaving the plant. This is unchanged, except for point of application as mentioned previously during the winter months. Our average daily consumption of activated carbon is 2,000 pounds, but when phenol is a problem, we will use 6,000 pounds or more.

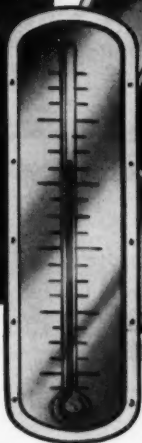
The net result of our work has been that for over a year and more, there have been no medicinal tastes in the water. Results are so encouraging that when a contemplated addition to the filter plant is made we shall arrange for chlorine application in the mixing basins after the application of carbon has been made. Because we think that the applied carbon has a greater efficiency if chlorine application is delayed, we have cut our normal carbon feed tables about 10%, resulting in 8% cost reduction in carbon.

At this time we are not prepared to state that we have had conclusive results. Our phenol problem occurs only a few times each year during the winter months and we do not feel that we have had sufficient recurrences to prove our point. We have had but one definite instance of phenols since changing our method of treatment, and this was handled successfully. We have not given the consumers a single medicinal taste in the finished water over one full winter and we are now approaching the end of another winter. We trust that our experiences may encourage others to experiment. We shall continue our own work and in another year or two we shall be better prepared to make a report.

A. G. Giannini,
Sup't. of Operations,
Department of Water Works,
Hammond, Indiana.

CONTROLLED DRYING Makes Your CLAY PIPE

- STRAIGHT
- ROUND
- SMOOTH



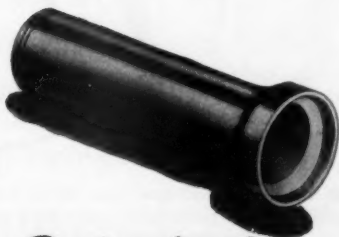
Nature makes Clay Pipe acid-proof and everlasting. It can't corrode, crumble, or rust away. But science works closely with nature to make Clay Pipe the engineer's top choice for every sewerage and drainage job.

Controlled drying keeps Clay Pipe uniformly straight for easier installation, round and smooth for maximum velocity. Warm air is circulated in and around the Clay Pipe, drying it evenly. Thermostats control the temperature. End result: the best pipe for your sewerage and drainage jobs.

When you specify Vitrified Clay, you're selecting the best efforts of science and nature working hand in hand. Together, they produce for you the *only* pipe that *never wears out!*

NATIONAL CLAY PIPE MANUFACTURERS, INC.

311 High Long Bldg., 5 E. Long St., Columbus 15, O.
703 Ninth & Hill Bldg., Los Angeles 15, Calif.
100 N. LaSalle St., Rm. 2100, Chicago 2, Ill.
206 Connolly Bldg., Atlanta 3, Ga.



SPECIFY

Vitrified

CLAY



PIPE



WRITE FOR DETAILED INFORMATION

Additional information and data on Vitrified Clay Pipe, Wall Coping and Clay Flue Lining sent FREE on request. State your specific questions. Simply contact the regional office nearest you.

C-451-2

Now's the time to mail this month's Readers' Service card.

Ready power for your hand pipe tools with **RIGID**



● Cut and thread more pipe faster, more easily with efficient No. 400. Lightest power unit made—one man can move it around on the job. Universal motor—forward, reverse, light socket power. **RIGID** 3-jaw chuck, with chuck wrench ejector; self-centering workholder in rear turns with pipe. Sealed-in lubrication. Plenty of power, pays for itself in time and work saved in hand tool threading, cutting, reaming. Ask for the **RIGID** "400" Power Drive at your Supply House.

RIGID

★ **Work-Saver Pipe Tools** ★

Need more facts about advertised products? Mail your Readers' Service card now.

BOOKS IN BRIEF

HIGHWAY ENGINEERING

There are few recent and balanced texts on highway engineering and this one is, therefore, a welcome addition to the engineer's library. Primarily, it is designed for junior and senior students in civil engineering courses, but it should be valuable to highway engineers facing problems in the field. It is quite impossible to review, abstract or summarize in the space available here the 693 pages of text or the 20 chapters into which the material is grouped, but it can be said that it covers the field and does it very well. The authors are L. J. Ritter, Jr., and R. J. Paquette, both of the University of Florida. Ronald Press Co., New York. \$6.50.

WATER WELL SUPPLIES

This 128-page loose-leaf book contains nearly 200 indexed types of supplies for water wells. These range from adaptors to whipstocks, and from bolts and nuts to complete water systems. Third Edition. No charge, we believe. National Supply Co., Box 416, Pittsburgh 30, Pa.

PENNSYLVANIA TURNPIKE

This is a new 19-minute Kodachrome motion picture describing the construction of the extensions to the ultra-modern Pennsylvania Turnpike. All phases of building are shown: 16 mm; sound. Write Portland Cement Association, 33 West Grand Ave., Chicago 10, Ill., giving notice of date of need and indicating size and nature of the group.

METER REPAIR MANUAL

Illustrated, step-by-step instructions for the repair and testing of Trident split case meters; 16 pages. Also contains instructions for setting up a meter repair shop, with photographs, floor plans and list of tools and equipment. Neptune Meter Co., 50 West 50th St., New York 20, N. Y.

MANUAL FOR WATER OPERATORS

The "Manual for Water Works Operators" has just been published by the Texas Water Works and Sewerage Short School. This is a

NOW... Front-End Shovels for ALL 4 New ALLIS-CHALMERS Tractors



14 Interchangeable Attachments

Standard Buckets
Light Materials Buckets
Heavy-Duty Buckets
Rock Forks
Bulldozer Blades
Plus other attachments
for some models

**Standard Buckets
up to 4 cu. yd.**

(light materials buckets up to 7 cu. yd.)

Introducing a New Era of Tractor Usefulness . . .

These new Tractomotive shovels on the larger size Allis-Chalmers tractors now bring you the same wide utility, the same outstanding performing ability as the popular HD-5G — the Tracto-Shovel that revolutionized excavating and material handling.

The Newest, Finest Tractor Line on Earth . . .

The new Allis-Chalmers tractors are not just refinements of existing models . . . they are new from the ground up . . . without compromise anywhere in design or materials. Back of their design are your own

ideas and those of your operators and mechanics. These are combined with the vast experience of Allis-Chalmers to set new standards of Performance, Durability, Simplified Servicing, Ease of Operation.



1-Yd. HD-5G

Drawbar hp.: 40.26
Dumping Height*: 9 ft. 1/4 in.
Total Weight: 16,200 lb.



2-Yd. HD-9G

Drawbar hp.: 70
Dumping Height*:
11 ft. 4 1/2 in.
Total Weight: 29,800 lb.



3-Yd. HD-15G

Drawbar hp.: 102
Dumping Height*:
12 ft. 8 in.
Total Weight: 40,000 lb.



4-Yd. HD-20G

Hydraulic Torque Converter
Drive—175 net engine hp.
Dumping Height*: 13 ft. 5 in.
Total Weight: 61,600 lb.

*Height of bucket hinge

ALLIS-CHALMERS

TRACTOR DIVISION • MILWAUKEE 1, U. S. A.

Originator of the Torque Converter Tractor



576 Weekly Calls...

THE GARBAGE MAN *won't* MAKE

The photograph above shows part of a 576-home project in Cuyahoga Falls, Ohio, where no garbage man will ever call.

That's progress . . . and a real saving in manpower, too . . . because a Westinghouse Waste-Away® Food Waste Disposer is being installed in each kitchen. Down the drain goes food waste, before it becomes garbage, shredded to the right consistency and flushed away with the proper amount of water.

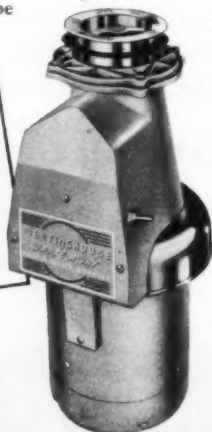
Yes, the Waste-Away is the ideal solution to a real problem—that of food waste disposal. It is safe, clean, efficient—engineered by Westinghouse for years of trouble-free service.

Why not consider this method of disposal for your own community? We will be happy to consult with you. Just write.

Westinghouse
WASTE-AWAY
ELECTRIC FOOD WASTE DISPOSER

... of course, it's electric!

WESTINGHOUSE ELECTRIC CORPORATION
Electric Appliance Division • Mansfield, Ohio



YOU CAN BE SURE...IF IT'S Westinghouse

It's a fact . . . our handy Readers' Service card is the easy way to get new catalogs.

book of 560 pages with many illustrations. The work of 30 authors, it was prepared under the direction of a Manual Committee composed of L. C. Billings, W. S. Mahlie, D. W. Robinson and V. M. Ehlers, with Mr. Billings, who is supervisor and chief chemist of the Dallas Water Treatment Plant, acting as Editor-in-chief. It is the third enlarged edition of manuals published in 1938 and 1943. In this edition are 21 chapters and 10 appendices.

Prof. E. W. Steel prepared the first chapter, Water and Its Impurities, and the sixth, Measurement of Water. Homer Hunter covered Surface Supplies and Henry Dabney the Sanitation of Surface Supplies. Other authors and subjects follow: Clyde Harvill, Ground Water Supplies; Asa Hunt, Pumping of Water; K. F. Hoefle, Service Meters; W. S. Mahlie, the Water Treatment Plant; L. C. Billings, Water Treatment Methods; A. D. Potter, Physical and Chemical Tests; A. C. Riba, Bacteriological Examination; C. H. Connell, Disinfection; J. K. G. Silvey and B. B. Harris, Algae; A. H. Ullrich, Water Softening; A. R. Davis, the Distribution System; J. B. Winder, Storage; S. C. Clark, Corrosion; D. W. Robinson, Industrial Water Supply; Uel Stephens, Construction and Operating Financing; S. R. Wright, Water Rate Structures; and C. H. Billings, Requirements of the State Departments.

The appendices include certification of water plant operators, by W. T. Gooch; Laboratory Equipment, Supplies and Solutions by J. H. Sorrel; Emergency Operations by J. L. Robinson, D. B. Dickson and R. G. Griffin, Jr.; and Safety Measures by M. C. Wukasch and F. S. Venable.

This excellent text, which will be useful and helpful to most every water works man can be purchased through the Bureau of Sanitary Engineering, Texas State Department of Health, Austin, Texas.

ILLINOIS RIVER

The pollution of the Illinois River basin has been studied by a Commission and a report about 4 ins. thick has been compiled. This has been summarized into a painless and informative booklet which probably can be obtained from C. W. Klasen, Secretary of the Sanitary Water Board, Springfield, Ill. The summarization is a fine job and might suggest improvements for other reports.

ANOTHER FAIRBANKS-MORSE DUAL-FUEL INSTALLATION!

Four 2-cycle Model 33 Fairbanks-Morse
dual-fuel engines.
2-10 cylinders—3,000 hp. each @ 300 rpm.
2-8 cylinders—1,600 hp. each @ 300 rpm.

**25,000,000
LOW COST Kw-h
per YEAR with
FAIRBANKS-MORSE
DUAL FUEL POWER!**

The basic and important economies of Fairbanks-Morse dual-fuel engines are amply evident in the first year's record of this 7200 hp. installation. Here are a few facts that should interest anyone who wants low-cost, unfailing power generation.

Plant requirements of 5600 hp. are met with three engines running at full load, one held in reserve . . . units in operation must run at an overload before the operator starts up another engine . . . frequently, electrical equipment is started across the line, pulling an estimated 500% overload . . . in one year there has not been a single shutdown due to engine failure . . . in six months the engines ran a combined total of 13,816 hours out of a possible 17,520 . . . engines can operate either as full diesels or on natural gas and can be switched instantly from one fuel to the other.

Look over these facts—then look into the matter of gaining the economies of dual-fuel operation in your plant. When you do, remember that there are more Fairbanks-Morse dual-fuel installations than any other—that Fairbanks-Morse has more dual-fuel experience—and that field conversion parts are available for many sizes and types of Fairbanks-Morse diesel engines. Write your nearest Fairbanks-Morse branch office or Fairbanks, Morse & Co., 600 South Michigan Avenue, Chicago 5, Illinois.

Look at this Six Months Performance Record!

1950	Kw-h Generated	Gas, MCF	Cu. ft. gas per kw-h	Fuel oil (Gals.)	#1 2000 hp.	Engine #2 1600 hp.	Hours #3 2000 hp.	#4 1600 hp.	Lube Oil (Gals.)	Hp. hrs. per gal lube
JULY	2,305,100	25,505	11.06	15,489	682	597	606	530	984	4,450
AUG.	1,931,300	21,814	11.29	13,235	568	503	503	558	831	4,613
SEPT.	2,116,800	22,507	10.63	15,698	613	539	642	525	891	4,709
OCT.	2,174,900	23,769	10.92	15,300	607	576	577	587	894	4,741
NOV.	1,913,800	21,225	11.09	15,909	538	578	449	584	931	4,117
DEC.	2,333,800	25,157	10.73	18,596	666	517	656	615	891	5,000
Total	12,775,700	139,977		94,227	3,674	3,310	3,433	3,399	5,422	4,601



FAIRBANKS-MORSE,

a name worth remembering

DUAL-FUEL AND DIESEL ENGINES • 2-CYCLE ENGINES • PUMPS
ELECTRIC MOTORS • LIGHT PLANTS • GENERATORS • SCALES

Heltzel
BUILDS IT BETTER

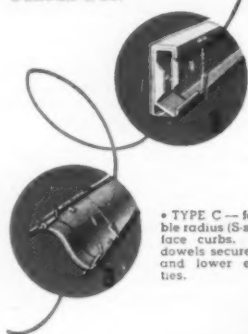
CURB & GUTTER FORMS

HAVE **3** INTERCHANGEABLE FACE FORMS



• TYPE B — for single (bottom) radius face curbs. Wedge is always chained to forms.

Heltzel steel forms augmented by various improvements through the years are the most rigid, advanced equipment obtainable. Your consideration of these steel forms is respectfully invited. Write for Bulletin L-20.



• TYPE A — for straight face curbs (no radii). Slide lock is rigid, positive.

• TYPE C — for double radius (S-shaped) face curbs. Sliding dowels secure upper and lower extremities.



... and
3 Optional
FACE CURB
FORM SUPPORTS



HELTZEL
STEEL FORM & IRON CO.
WARREN, OHIO

Now's the time to mail this month's Readers' Service card.

JOBS FOR ENGINEERS

We have a number of vacancies for structural engineers, squad leaders, designers, junior engineers and draftsmen capable of doing design work. We are especially interested in men with experience in structural work pertaining to power plants, office buildings, laboratories, wharves, transmission lines, subways, subaqueous tunnels, wind tunnels or industrial structures. Consideration will also be given to recent graduates. Full information will be sent on request, accompanied by a statement of experience.

O. G. Julian,
Jackson & Moreland,
Park Square Bldg.,
Boston 16, Mass.

LEADERS IN THE PUBLIC WORKS FIELD

Dewitt C. Greer, for the past eleven years State Highway Engineer of Texas, is pretty much a Texas product. Graduating from Texas A&M back in 1923 with the degree of B.S. in Civil Engineering, he joined the State Highway Department as a field engineer in 1927. In 13 years he progressed to be the head of one of the nation's most efficient and effective state highway organizations, having been appointed to his present post in 1940. Under his leadership, the paved mileage of the State Highway System has increased from 17,400 miles to 37,000 miles. This development, Mr. Greer modestly ascribes to an "efficient department and the support of the department by the citizens of the State."

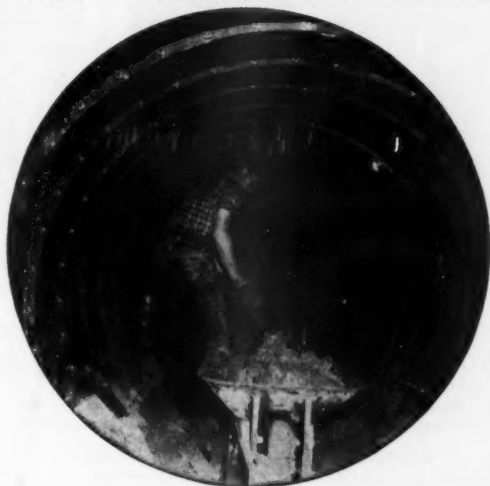
As might be expected from an A&M graduate, he is interested in football (when the Aggies are playing) and in baseball. He has also been active in professional associations, and holds membership in the ASCE and the AASHO. He is the immediate past president of the latter and a member of the Executive Committee; and a member of the Executive Committee of the Highway Division of the ASCE.

Mr. Greer and the former Helen Colton of Athens, Texas, were married in 1923 and have one daughter, Ann, now fifteen.

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TRAFFIC**



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new
sewers**



Remember when new sewer installations meant traffic snarls, safety hazards and general inconvenience? Fortunately, that can be a thing of the past.

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Armco Liner Plates are amply strong, yet light in weight and easy to handle. In fact, one man can easily carry, hold and bolt an Armco Liner Section into place. No special equipment is required. Excavation is kept

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Let us tell you more about the greater safety, convenience and economy of using Armco Liner Plates on sewer installation jobs. Write for complete information. Armco Drainage & Metal Products, Inc., 1541 Curtis Street, Middletown, Ohio. Subsidiary of Armco Steel Corporation.

Armco Tunnel Liner Plates



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Portland, Ore., contractor reports:

Chas. T. Parker, of Parker-Schram Co., says: "On this 36" pipe line using Dresser Couplings, a foreman, crane operator, oiler and six-man crew were able to average 15 lengths per day, complete except for coating. This in spite of almost incessant heavy rains. Where ditch was available without obstruction, we were able to complete about five lengths per hour. We know of no better method of connecting lengths of pipe in a water line."

*A
Dresser-Coupled
steel line*

**delivers
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The cheapest way to deliver water to the place where it turns into revenue is with a Dresser-Coupled steel line—the line that cuts *installation costs, leakage losses and maintenance costs.*

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Maintenance costs are reduced also. Dresser Couplings harmlessly absorb underground stresses; and modern glass-smooth pipe linings, undamaged in joining because there's no heat, assure sustained high carrying capacity.

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BE SURE you get the best line at the best price. Put steel pipe and Dresser Couplings in your specifications.

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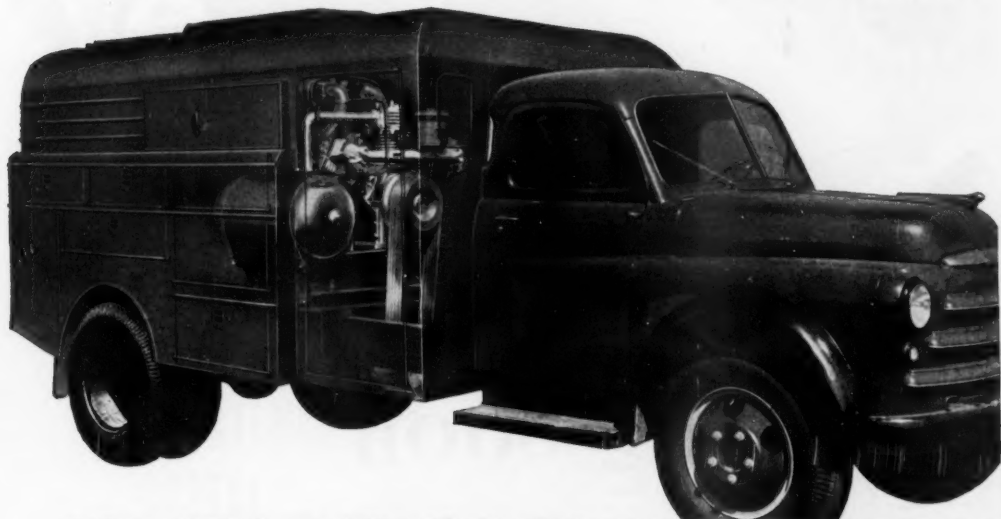
"FLEXIBLE-TIGHT"

COUPLINGS

Dresser Manufacturing Division, 59 Fisher Ave., Bradford, Pa. (One of the Dresser Industries). Warehouses: 1121 Rothwell St., Houston, Texas; 101 S. Bayshore Highway, South San Francisco, California. Sales Offices: New York, Philadelphia, Chicago, Houston, South San Francisco. In Canada: 629 Adelaide Street, W., Toronto, Ontario.

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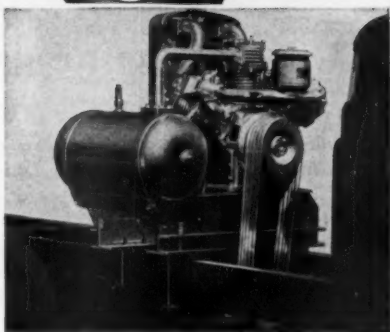
Delivers 125 cfm at 100 psi instead of usual 105 cfm; will run 2 heavy breakers at full pressure and efficiency.

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For full information, send for Catalog TC-1. The Jaeger Machine Company, 400 Dublin Ave., Columbus 16, Ohio.



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Compressor unit is the famous Jaeger "Air Plus"—air-cooled, W-type, force feed lubricated—the largest selling compressor in the construction field.

Power take-off has only 4 moving parts—no gears, no power losses. Simple to install, proved on hundreds of installations.

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● At Fontana, California, Koppers is building a new, modern plant for the production of Bitumastic® Enamels, the Coal-Tar Base Coatings which have been famous for nearly a century for protecting underground and underwater metal surfaces from corrosion. This plant, which will also produce Koppers Roofing Pitch, will be the first such plant to be located west of the Rocky Mountains. From it, Koppers will be able to provide improved service

to West Coast users of Bitumastic Enamels.

Bitumastic Enamels are the tough coatings that are used to protect buried oil and gas pipe lines against severe corrosive elements. Large-diameter steel water pipe lines also are protected, both inside and out, by Bitumastic Enamel. On the inside of the pipe, this enamel is applied in a smooth lining that keeps flow capacity high and reduces pumping costs.

Processed from a base of Coal-Tar Pitch, Bitumastic Enamels are impervious to moisture and are chemically resistant to soil elements. They make a tight bond with pipe and other metal surfaces, do not disintegrate with age, and maintain continuously high electrical resistance.

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ON DORR TYPE S
(ROUND)
CLARIFIERS**

SIZE	100'-200' DIA.	UNDER 100' DIA.
PURCHASE PERIOD	1931-42	1932-35
YEARS IN SERVICE	4-15	11-14
NUMBER OF UNITS	115	95
TOTAL REPAIR COSTS	\$3,568	\$2,933
PER UNIT	\$31	\$31
TOTAL REPAIR COST FOR ENTIRE PERIOD AS % OF ORIGINAL COST	0.27	.77

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Check these facts...

ON DORR CLARIFIER MAINTENANCE COSTS!

A glance at the figures above will tell you exactly what repair costs can be expected with Dorr Clarifiers.

These figures are substantiated facts ... not estimates, guesswork or wishful thinking. We believe they cannot be matched.

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We'd like to tell you how Dorr Clarifiers stack up on performance too. Ask a Dorr engineer for the facts.



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Progressive Civic Officials are Getting the Facts About...

Hotpoint's *Municipal Plan of Food-Waste Disposal*

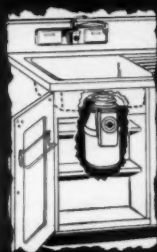
Modern-minded municipal officials are investigating the Hotpoint Municipal Plan of Food-Waste Disposal. Highly satisfactory reports from numerous communities, which have dispensed with the "can and wagon" garbage collection system, prove the values in the Hotpoint plan.

Study these advantages made possible by the Hotpoint Disposall® Food-Waste Disposer. If you would like to provide your community with a modern, sanitary, economical method of disposing of food-waste before it becomes garbage, Hotpoint will gladly present the Hotpoint Municipal Plan—based on experience and written specifically for municipal officials.

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- True sanitation for your town.

And—it saves you money!

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5600 West Taylor St., Chicago 44,
Illinois, for all the facts.



The Hotpoint Disposall food-waste disposer is easy to install in any sink... convenient... safe... odorless and economical. Simple to operate... keeps kitchens, sinks and hands clean. Does not overload or clog sewer systems. Can also be used with septic tank.

Hotpoint Inc.

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HYDROCRANE

S-t-r-e-t-c-h-e-s
Day's Output From
75 to 400 ft.
Of Pipe Per Man

"We've put our Hydrocrane to work with a 5-man crew and averaged setting 2,000 ft. of 6-in. cast iron pipe (caulked) in an 8-hour day — the best an 8-man crew did without the Hydrocrane was 600 ft. a day," states M. R. Bowen, Director of Public Works, Whittier, Calif. "What's more, on one job, 5 of my boys and our H-2 set 1,100 ft. of 6-in. (not caulked) in two hours. Often the Hydrocrane is slowed up because ditching rigs don't move fast enough."

NEW JOBS ALL THE TIME

"This machine fulfills all our expectations on pipe work — and is finding use on new jobs all the time," Bowen added. Digging house connections is one example. Previously these were hand dug — now the Hydrocrane handles the complete job except pavement breaking — excavating, setting pipe, backfilling — saves at least 50% in labor.

SHUT-OFFS SHORTER — SERVICE BETTER

The Hydrocrane also handles water main leak re-



Here Whittier's H-2 sets water main on a busy street. Note how easily this compact crane works under overhanging wires. Operation is particularly smooth with every work function fully hydraulic.

pairs. While it saves labor here too, the big advantage is speed. With this fast traveling, hard digging unit, mains are repaired and back in service far faster than ever before. Other Hydrocrane jobs include unloading and stockpiling pipe, moving equipment, hauling materials and for miscellaneous excavation.

"Never thought we'd keep her so busy" — this is a typical comment by municipal users. Convince yourself. Write now. Two sizes — ¼-yd. 2-ton, ⅜-yd. 3-ton. Attachments include clamshell, crane hook, material-handling and catch basin buckets, grapples, magnet.



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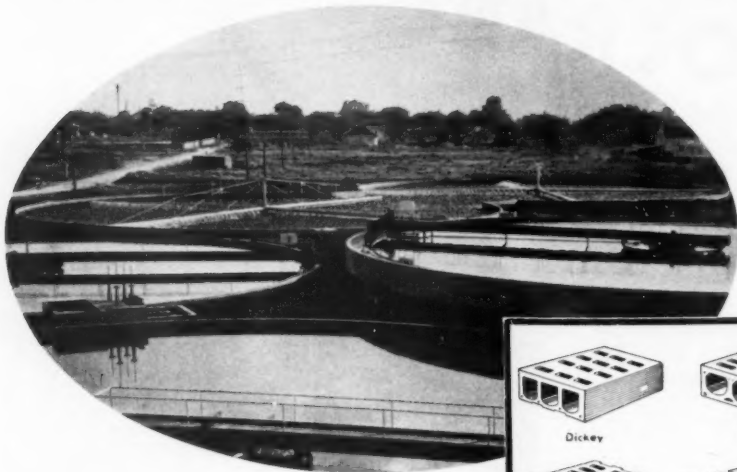
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97H81

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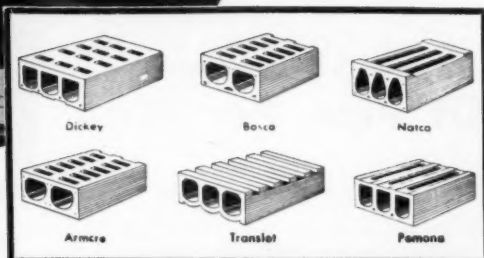
142 ft. WALKER Positive Seal Rotary Distributors at Fond du Lac, Wisconsin

1. Use TFF Institute SPECIFICATION Underdrains

Trickling Filter Floor Institute *specification* underdrains are used in all modern filters where better results and trouble-free operation are desired. They are scientifically designed for that purpose and made of the finest quality vitrified clay. The size of the top openings insures proper ventilation of all the filter media and free discharge of the filter effluent. The run-off channels are extra smooth for non-clogging, quick drainage.

These blocks will carry applications up to 50 MGAD. Unskilled labor can lay them easily because they are light-weight and self-aligning. And the blocks are strong enough to work on after laying and to support safely even very deep filter media. They are best for all kinds and shapes of filter.

On your next filter, use the best equipment you can get . . . and give it a *specification* floor of *Vitrified Clay Filter Bottom Blocks*. Ask any member of this Institute for full engineering details. Write today.



These one-piece blocks are Easy to Lay, Acid Resistant, Proved by Use and Won't Clog

2. Use Good Equipment

Although Walker Process Equipment, Inc. is only a little over five years old, its organization has been making rotary distributors since 1932. Its president says they developed the first commercially accepted positive seal (replacing the mercury seal) and sealed lower thrust bearing. An important feature of the positive seal is the use of a commercially proved Neoprene lapping seal backed up by a stainless steel coil spring that insures contact at all times, even under low back pressure.

Engineers know they can depend on Walker Process Equipment for excellent service under all conditions. So Jerry Donohue Engineering Company matched this fine Walker rotary distributor with a *specification* floor of *Vitrified Clay Filter Bottom Blocks* . . . the best kind of filter floor available.

TRICKLING FILTER FLOOR INSTITUTE

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For more engineering details, circle number 20 on Reader Service Card.

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**Pays for Itself
in No Time
Clearing Out
Wooded Land**



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**ONE MAN
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**27 Pounds
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Remember, you can't start any building or construction job until the location is properly cleared. And with this new Homelite One Man Chain Saw, you can do your clearing in less time . . . with less labor . . . and at less cost. It's the fastest cutting, easiest handling saw ever developed. And it's a rugged, dependable saw that needs less maintenance, fewer repairs, than any other saw.

Weighing only 27 lbs . . . and perfectly balanced, with most weight close to operator's body . . . a Homelite handles perfectly on all types of cuts. Any man can operate it easily. Send for new, complete bulletin.

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Thousands use our Readers' Service card to keep up to date . . . do you?



Laying a half-inch top course of hot mix.



Rear wheels down and the machine is off to start the parallel course.

YOUR Adnun Retractable Wheels cut the cost of your short hauls. Supposing you have been working a week down one side of a job and want to get back to start the parallel course — it takes just a few minutes time to let down your Adnun Retractable Wheels and hoist the Adnun up to the tail gate of your truck. You are back at the beginning and ready to start on the new course before you could load the ordinary black top spreader on a trailer!

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The Adnun cuts truck and trailer rental, saving you costs up to \$12.50 to \$25.00 an hour and it saves time in loading and unloading.

Add to this feature Adnun versatility of spreading aggregates, Adnun ability to lay a tighter joint for safer roads, lower upkeep costs, freedom from rebuilding and other features that reduce construction costs and increase output. Ask for the booklets, "11 Basic Things..." and "Roads That Last". They bring out some new thoughts on asphalt paving equipment.

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Subsidiary of Blaw-Knox Co.
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Iron and Manganese, present in many municipal water supplies, form stains, impart metallic taste, and cause clogging deposits. They interfere with practically all industrial processes, and make water undesirable for home use.

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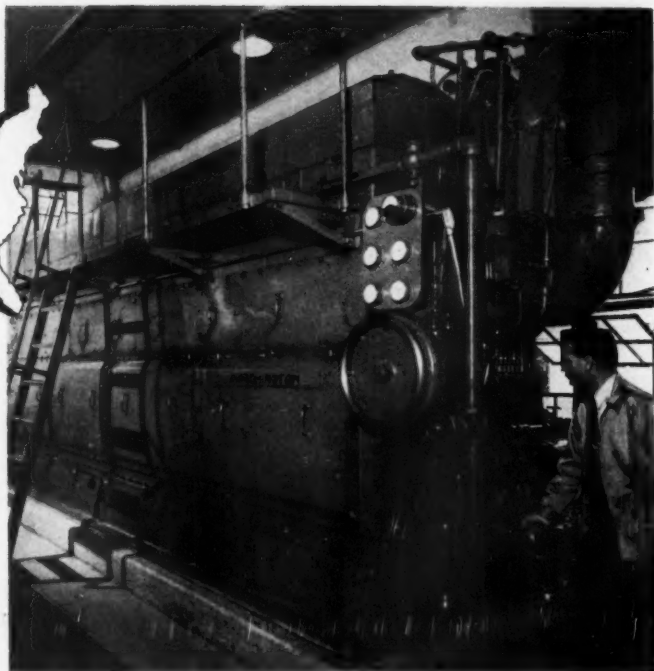
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WATER CONDITIONING HEADQUARTERS FOR OVER 38 YEARS

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How are things
in Mora, U. S. A.?

Rates Cut, Profits UP!



Things are as good in Mora, Minnesota as the song says they are in Glocca Mora.

Worthington Diesel engines operated by the municipal power plant in this progressive community have helped produce the lowest electric rate of any full Diesel municipal power plant in the state.

A Worthington 4-cycle supercharged engine, operating at low load factor of 42.6%, produced in 1950 5% more power per gallon of fuel than a 2-cycle engine operating at 59.4% load factor. Following the installation of the Worthington engine, rates were cut in 1949, yet net profits, in 1950, were greater than ever.

Worthington four-cycle supercharged

engine is particularly well suited to the needs of a growing community like Mora—whose peak kw load has increased an average of 11% a year in recent years. Even when over-powered, a plant can operate at very low fuel cost and have the added engine capacity when needed without additional investment.

When you buy a Worthington 4-cycle supercharged engine, you benefit, too, from the longest experience of any manufacturer with this type of engine. For any engine application, call on Worthington—an engine for any fuel: oil (crude or regular), gas or "dual fuel". Worthington's complete line of engines assures you of the

most economical operation no matter what fuel you use.

If gas or any combination of gas and oil offer fuel economies, consider Worthington gas or dual fuel engines. Only Worthington offers such exclusives as dual plunger pumps, gas micro-metering valves for each cylinder and thermal air controls—all built to give optimum performance for the fuel used.

For further details of the dependable, economical Diesel performance that proves *there's more worth in Worthington*, contact Worthington Pump and Machinery Corporation, Engine Division, Buffalo, New York.

WORTHINGTON



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**ECONOMICAL
CONTINUOUS POWER**
Diesel Engines, 150 to 2640 hp
Gas Engines, 190 to 2880 hp
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WORTHINGTON-BUILT AUXILIARIES



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Cooling Water
Circulating Pumps



Evaporative Type Engine
Water Coolers

Get full details of this month's new products . . . mail your Readers' Service card today.



AN OUTLINE FOR ACTION FOR CIVIL DEFENSE

TO most Americans, the name Oshkosh may symbolize motor trucks, overalls, luggage, or even evoke humor as a city name. To the city's 43,000 residents, Oshkosh is an average American city that is fully conscious of the ever-changing national and world events. More than a handful of its men have been recalled to active service. Every month boys from the city and surrounding countryside leave for the draft induction center. An industrial city, with vacationland facilities at its doorstep, Oshkosh is located 86 miles north of Milwaukee and 50 miles south of Green Bay at the confluence of the Fox River and Lake Winnebago.

In World War II, like the rest of the mid-west, Oshkosh studied the family Atlas and decided that its thousand or more miles distance from either ocean warranted complacency about possible enemy action. Oshkosh had, like many other cities, a Civil Defense organization which sold War Bonds after D-Day in 1944.

This time, Oshkosh looked at a world globe, rather than an atlas, and decided that its former complacency had little foundation because of its closeness to the polar

R. C. RUTLEDGE
Director of Public Relations
Oshkosh, Wis., Civil Defense

air route into Milwaukee and Chicago. For that reason, Oshkosh is quietly and efficiently mobilizing a Civil Defense organization which will be able to cope with any local emergency and assist any neighboring city which should become a target area by intent or accident.

An Outline of Action

In reviewing Oshkosh Civil Defense, we do not want to suggest that Oshkosh be considered a criteria for other cities, because each community's problems are individualistic to that community, from its geographical layout to its manpower assets. The following is merely a brief outline of the positive action taken by the city of Oshkosh; whether it is right or wrong, only time will tell.

First, our national government has indicated that the nation's cities should not look to Washington to set up Civil Defense in every city. Nor does it offer a "master-plan" which merely calls for filling in the

names of local people in blank squares, on an organizational chart, to make the plan workable and functional in all communities. The state government cannot do the job for the local community either. The full responsibility rests on each city and its residents to organize in a manner best suited to the needs of the community. Last summer, shortly after the start of war in Korea, Oshkosh weighed all known facts about world events in relation to its own geographical advantages and disadvantages and decided to form a Civil Defense organization. After "closed door" discussion pro and con, Mayor Ernest Siewert called in a large group of men representing all phases of the city's industrial and business life including management, labor and private citizens. By common consent, this group agreed not to wait for national or state directives on Civil Defense; instructed the mayor and city attorney to review the city's World War II Civil Defense ordinances; and recommended that the mayor organize a smaller advisory committee to serve as a nucleus in the formation of strong, flexible Civil Defense organization.

Last September, the Oshkosh Common Council authorized the formation of a mayor's advisory council consisting of two aldermen and two representatives of labor, police, fire, industry, retail stores, public utilities, and communications. Fortunately, W. Mead Stillman who was director of World War II Civil Defense was still available, and he was pressed into service as the coordinator and assistant to the mayor. This group examined the organization chart used previously, the now-famous disaster plan of Milwaukee, and contacted other cities around the state for information on their own local plans. Legally, they found,

the Civil Defense organization of World War II had never been officially disbanded. The old ordinances were brought up to date by Council action, and Civil Defense became a new, legal entity of the city government, as much a part of the city administration as the park board, school system, or street department. There were volunteer auxiliaries for municipal departments; protective divisions specifically assigned to city-wide industrial plant and public building protection; and emergency welfare, inter-city mutual aid and mobile support, transportation, radiological work, air-raid wardens and public relations.

Work Begins in Earnest

Under Mr. Stillman, in October, Civil Defense began functioning in earnest. The mayor's advisory committee, meeting frequently, screened dozens of men for many jobs and arbitrarily selected the most obviously qualified men for specific jobs. Hundreds of Civil Defense application forms were filled out by members of the city's service clubs, veterans' organizations and other groups. Within a month, most of the key positions were filled by men selected for their ability as "self starters" and for recognized specialties, either by vocation or avocation. Each man was given full responsibility for his division.

Every Monday afternoon at 4:30 all division heads meet at the City Hall to review their activity during the previous week. Each division head reports in writing, on a prepared form, and uses that as a basis for his verbal report to the group which is thus kept fully informed

of each other's progress, problems and solutions. The reports are then coordinated, combined and released to the local press and radio by the public relations division.

Working on, the basic three-fold plan of organization, training and activation, Oshkosh is well along in the first phase. The two basic services, fire and police, have nearly a hundred volunteers each studying and working with their respective chiefs and city-paid department employees. In each of the city's sixteen wards, senior air raid wardens are organizing block wardens; individually and selectively; and avoiding widely publicized promotional schemes to recruit workers. The medical division has organized all the city's doctors, dentists, nurses, morticians and allied specialties. The mutual aid division has prepared plans to provide and transport equipment and trained men to cities which may need assistance beyond

their own facilities. The emergency welfare division, working with the Red Cross, is preparing plans to feed and house people should a neighboring city require the evacuation of its citizens to Oshkosh on short notice. The city's industrial plants have assigned personnel for special training in fire and anti-sabotage work. The city's public buildings, including retail stores, recreational buildings and churches have started protective planning. The city's public and parochial school children have filled out disaster registration cards which will be filed apart from regular school records. The subject of radiological protection has a class of serious minded men and women who meet weekly from 9:30 to 10:30 Thursday nights. The subject of microfilming all important and irreplaceable records of the city and private business and industry is being investigated. Organizationally, Oshkosh Civil Defense looks back over the past six months and acknowledges much has been done.

The second phase, training, is about to begin. A school principal, Paul Smith, heads this division. His predecessor, Lou Lyons, was forced to retire due to a heart attack.

As this is written, the first classes for air raid wardens are being held in one of the city's schools. A team of five trainers have started their lectures on the need for Civil Defense and Civil Defense in action.

The story of Civil Defense in Oshkosh changes from day to day. A news release of two weeks ago is as out-dated as the paper in which it was printed. No attempt is being made at this time to go "all out" in selling Civil Defense to the public at large. The primary job is to get a well-rounded organization trained, and then the public's part and responsibilities will be clearly and concisely outlined.

The men forming the nucleus of the Oshkosh Civil Defense come from all businesses and professions. They are all men who accept this new responsibility as a natural outgrowth of their civic interests and desire to serve the community.

To discuss in detail the work that has been done in each division would take far more time and space than can be allotted to the subject. If this review serves as a guide for even one small or medium-size city in the formation of a practical Civil Defense structure, the writer will feel rewarded and the City of Oshkosh satisfied that it is making a contribution to the general welfare of the nation.



● AN air view showing the central portion of the city of Oshkosh.



TIME AND MONEY - SAVING METHODS AND EQUIPMENT

TRUCK LOADER

has many uses

GLENN MANZ,

Director of Public Service & City Engineer,
Lansing, Mich.

WE have two Holmes-Owen loaders on Chevrolet trucks. They have been in use since last spring and we are very much pleased with their operation. We purchased them primarily for loading into trucks street sweepings, which had been dumped at street intersections by motor street sweepers. In the past, two shovelers were carried on each truck for hand-loading sweepings. These shovelers spent about as much time riding to and from the disposal area as they did loading. More important was the fact that this crew could not keep up with the sweeper, particularly when sweepings were heavy, as in the spring and fall. With these loaders, we have been able to eliminate a man from each truck and we have no trouble keeping up with the sweepers.

There have developed many other uses for these units. Gravel is loaded equally as well as sweepings, and we make excellent use of them during the winter months in loading snow. They are very handy in loading snow from street intersections and bridges, as they present little interference to the normal flow of traffic and are fast and efficient loaders.

Another job for the loaders was found in the month of October when we used them for loading leaves. We were able to keep the streets cleaned almost as fast as the leaves fell. The accompanying pictures show one loader being used for loading rock salt from our stock pile. The uses for this kind of equipment are numerous and varied. We are more than pleased with the operation of the two units we have.



● **LOADING** truck with salt for ice control with Holmes-Owen loader.



● **CLOSE-UP** of loader showing method of attachment to light truck.

Denison Installs Permanent Traffic Markers

Wilbourn McNutt

ONE of the first cities in the Southwest to install Dur-O-Line traffic markers was Denison,

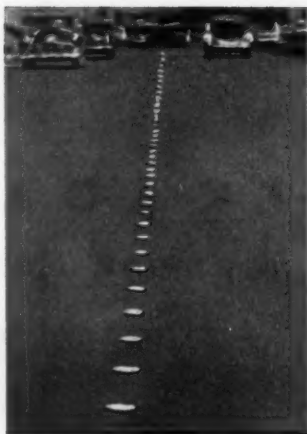
Texas. These consist of yellow or white discs which are fastened to the pavement with a mastic and a pin. It was on the recommendation of the City Engineer, E. C. Drumb, that five hundred of these markers were installed in September, 1949, on a trial basis. These were installed

on Main St., right in front of the City Hall. So favorable was the public and official reaction, that an additional 7,000 markers were ordered to finish out the main business street. Since that time, another 8,000 have been ordered.

Approximately 700 of the markers are required per block, including enough for a main division or center line, right and left lanes at intersections, and diagonal parking lanes. Two men can complete installation of the markers in one block in an 8-hour day, according to Mr. Drumb.

These markers have a life expectancy of six years, and it is estimated that the markers already installed and to be installed will save the city about \$9,000 in that time.

On Denison streets, the markers were spaced 3 ft. apart for the center stripe; on diagonal parking strips, six markers were used to outline each succeeding stall. On crosswalks and on traffic guide lines, the recommended spacing of markers is 2 ft.



● **DUO-LINE** center markers.



● **DUO-LINE** parking lanes.

Cold Patch Material Heater

Henry Bruneel,

Sup't. Streets, Mt. Clemens, Mich.

OUR oiled streets develop chuckholes in late fall and early spring. At this time, the pre-mixed cold patch material has hardened in the stock piles. Even if the chunks can be broken up, the material will not adhere in the patches without being heated.

To get away from the slow and unsatisfactory methods of heating the pre-mixed material by direct flame from a torch or by piling over a pipe with flame in the pipe, which burns the asphaltic material in either case, we asked the Chausse Mfg. Co. to incorporate our ideas into a relatively inexpensive heater for this purpose.

This heater consists of an insulated fire box under a steel plate with the plate protected against direct flame from the burners. The end of the material box is open, with low steel side plates on the other sides. Heat is supplied by two coil type oil burners with a 20-gallon fuel oil tank.

The whole unit was kept low so as to make easy shoveling from the end, and the side plates are also low so that, at times, the patching material may be taken from the sides. With no obstruction in the end and with the unit on a slight



● **LOMPOC'S** specially equipped water truck is described on page 47.



● **COLD** patch material heater devised by Chausse for Mt. Clemens, Mich., speeds up street patching work, especially in cool weather.

slant towards the rear, the material box is self draining.

The heater holds three tons of patch material and it requires 20 to 30 minutes to heat the material for use, using both burners. To accelerate the heating, we wet down the load with a water hose and the resulting steam quickly breaks up the chunks. We then turn off one burner and proceed with the patching.

With a crew of three men, we use five loads, 15 tons, of the patching material per 8-hour day.

Special Equipment for a Water Department Truck

L. G. Fabing

Sup't., Lompoc, Calif., Water Dep't.

Our truck is a Dodge, 4-wheel drive, with power take-off mounted on the front with 250 ft. of 7/16 in. cable. The body is standard 1-ton pickup to which we added special side carrying bins for a complete set of tools and small fittings, as well as a complete stock of repair material for emergency work. We have equipped the truck with 2-way radio which makes it possible to contact it at any time from the main office, or the operator can call the main office.

We think the most outstanding feature of this truck is the steel portable A-frame mounted on the front. This was designed by the writer and built mostly in our shop. It takes only 15 minutes to mount the A-frame and we use it for lowering heavy pipe into the trench, placing large valves and fittings, setting fire hydrants and handling other heavy material.

When any stock is used from the truck, it is promptly replaced by the driver so that everything is ready for an emergency call, day or night.

Hydro-Crane Has Many Uses

H. S. Merz,

Sup't., Water Dep't., Rockford, Ill.

THE first hydro-crane we bought some years ago was so useful and versatile that, two years ago, we bought another one. We use these in so many different ways that we wonder how we ever got along without them. Some of the uses are: Unloading pipe, filter gravel and coal from gondolas; lowering 8-inch and larger pipe into the trench



● POWER crane reduces leak repair time in Sheboygan by 50%.

when laying mains; digging service holes, holes for leaks and manholes; taking off removable roofs from buildings housing deep wellpumps; and setting pumps and machinery.

Probably the use most appreciated by the staff is the digging for leaks. It is much easier to take the wet, sloppy mud out with a clam bucket than it is to do it by hand. The hydraulic features are particularly useful, and the finger-tip control on the lifting line helps a lot when laying pipe or setting machinery. When working around trees and wires in residential areas, the ability to retract the boom from 22 ft. to 15 ft. is very convenient.

This sounds like an ad for hydro-crane but we are a very pleased customer.

Handling Leaves and Street Signs

C. E. Brokaw,

Sup't., Highway Maintenance Division, Cincinnati, Ohio.

For a more efficient leaf removal job, we fitted a Scoopmobile loader with a 84-inch pan. This loader now handles more leaves than four vacuum type loaders. The cost of leaf removal in Cincinnati has been reduced 50%. Timing of the work is much improved and due to the rapidity with which it is carried on, fewer leaves enter sewer inlets or otherwise become nuisances and sources of complaints. We have prepared a 10-minute movie of this

operation on 16 mm silent black and white film and will loan it on request.

Special traffic sign truck bodies were designed by this Division. These bodies have storage bins for carrying different sizes and types of signs. Space is provided for installation tools, hardware and sign posts. These bodies have reduced our costs, due primarily to reducing the number of trips to and from the shops each day. Drawings and specifications of the unit are available from the writer; and the Division also has a 10-minute silent color film, 16 mm, showing the equipment and its application.

Power Crane Saves Water Department Money

Time required for repairing leaks in Sheboygan, Wisc., has been reduced as much as 50% by using a hydrocrane. This mobile power unit is especially effective in uncovering leaks, and it does this with increased safety for the men. The crane does the digging, eliminating the danger of caving or quicksand.

This crane is also used for laying pipe. On one job it handled 200 ft. per day of 12-inch pipe and could have placed much more if the trench had been ready. Other uses for the hydrocarbon include setting hydrants and valves, unloading pipe from cars and loading it onto trucks for job-side delivery.

Jerome C. Zufeldt is superintendent of the Sheboygan Water Department.



MAP RACK FACILITATES PLANNING

SUPERIOR, Wisconsin's new oil city, has unique and complicated planning problems. Her relatively small population of about 36,000 occupies an area large enough to contain a city the size of Milwaukee. The city is composed of seven separate communities with large dead tax areas between most of them.

This situation is an inherited burden from yesteryear. When Superior was originally platted it was believed that this strategically located city would soon grow to the size of Chicago. Its natural shipping facilities, rail-heads and industrial beginnings made it look like a natural. Then came the panic of 1893. Following this, other set-backs of varying importance took place. Finally, the depression of the 1930's set the city back on its heels.

Once again industry is moving into Superior. The future looks brighter. But a lot depends on careful planning and the diligent study of land-use areas; all to the end that Superior can grow and be care-

fully knit together without major upsets.

The City Council, the City Plan Commission, and other special purpose committees, are charged with these planning responsibilities. Large maps, many maps, are required in their studies.

City Manager Robert E. Baumberger and Director of Public Works Thomas M. Basterash foresaw the need for some method of having maps readily available for instant use as the study required. It was desired to have maps mounted flat on self-supported vertical surfaces for group viewing. Hundreds of square feet, for a starter, were required to mount these maps. Eventually thousands of square feet of mounting surface, all to be instantly available, and all contained in a small space, would be the goal.

FRED M. SEGUIN

Being on the engineering staff of the Public Works Department, Mr. Basterash had me study the problem to see what I could come up with in the way of a plan. The accompanying plan illustrates the details of the map rack as it was actually built in our City shop. Each map mount has a usable area of fifty square feet. Single maps as large as 5' x 10' can be mounted by bridging adjacent mounts. Only ten map mounts have been made up to date; but the rack has a capacity of 41, which leaves a considerable margin for expansion. It might be well to note that the size of the map mounts was determined to a large extent by the dimensions of maps on hand.

All-welded steel construction was chosen for its neat appearance and lifetime rigidity. As it was desired to be able to disassemble the structure for the purpose of occasionally moving it to other buildings, the feet are bolted to the frame and the map mounts are detachable by simply pushing up and out at the bottom.

When reassembled the map rack can be easily moved about the room by one person as it rolls easily, but not loosely, on its ball bearing truck casters, which are welded to the feet and should never give trouble.

The total weight of the complete structure with 10 map mounts is 760 pounds. When dissembled for moving, the separate parts weigh as follows: Frame, 229 pounds; each foot, 80 pounds; and each map mount, 37 pounds.

Details of the Mounts

Some of the details shown on the plans undoubtedly deserve further discussion. Great care should be taken in the assembly of the frame to insure squareness of connecting pipes, equal distance between the top and lower crossbar throughout the entire width, and accurate spacing and matching of map-mount holes between the top and lower crossbar.

It will be noted on the plans that the frame should be pitched back from vertical one inch at the top. This requirement is necessary for the reason that very few floors are level and that slight inaccuracies are to be expected in the construction of such a large frame with ordinary shop facilities. This precaution will prevent the map frames from swinging to the front of their own accord. Because the vertical axis is back past center the map mount will stay on one side or the other, as desired, so that a map mounted on either side of the frame can be viewed at leisure. This pitch can be accomplished by pitching the 1-foot long 3-inch pipe sleeve back about

$\frac{1}{8}$ -inch from vertical at the top when it is welded to the channel foot.

Before leaving the frame another very important consideration should be pointed out. The distance between the top and lower crossbars must be a little greater than the dimension between the upper surface of the top map mount pipe and the lower end of the map mount vertical pivot pipe. This is so that the map mounts can be readily detached from the main frame. The clearance should be at least $\frac{1}{16}$ inch and preferably $\frac{1}{8}$ inch when the map mount is raised for removal from the lower bearing holes.



The 2-inch pipe liner inside the lower crossbar forms the bearing for the pivot pipes of the individual map mounts. Although the outside diameter of the 2-inch pipe is 0.094 inch smaller than the inside diameter of the $2\frac{1}{2}$ -inch pipe, slight irregularities in these pipes will cause them to be a snug fit. The thickness of the $2\frac{1}{2}$ -inch pipe wall determines the depth of the bearing hole. The wall thickness of standard $2\frac{1}{2}$ -inch pipe is 0.203 inch and this depth is ample as there is no tendency for the pivot pipe to jump out of the hole as the map mount is swung from side to side.

The inset of the rear view of the 3-inch x 1-ft. pipe sleeves illustrates how the back of the pipe is cut away

so that the bolts can be drawn up snug for maintaining rigidity throughout the structure. This is necessary as the $2\frac{1}{2}$ -inch pipe would be a loose fit in the short length of 3-inch pipe and cause a loose connection. Compressing the sides of the 2-inch pipe at the top to effect a snug fit with the inserted pipe was found to improve the appearance of the connection.

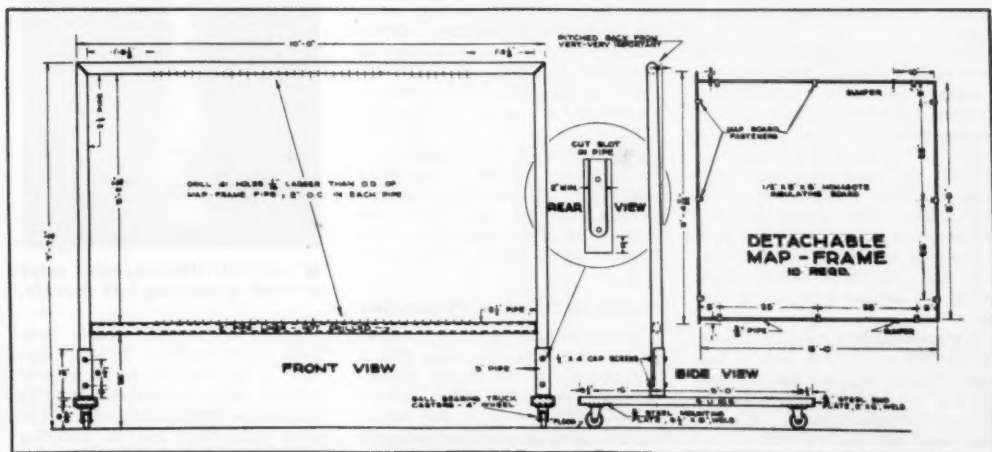
Materials for the Boards

A study of locally available materials for the map-mount boards showed that Homasote building board was the only desirable material that could be obtained in single 5-ft. x 5-ft. sheets (these were cut from 8-ft. x 14-ft. sheets by the vendor). This is a firm, stiff insulating board that takes and holds thumbtacks nicely and has turned out to be an excellent choice. Weight is minimized without sacrificing rigidity.

The map board fasteners were made from $1/16$ -inch x 1-inch iron strap cut in $3/8$ -inch lengths and shaped in a vise around a jig consisting of a section of $3/8$ -inch pipe welded to a piece of $1/2$ -inch steel plate. It was found that no washers were necessary, nor desirable, in fastening them to the map mount frame and board.

The map mount bumpers serve to prevent the mounts from contact that would allow them to catch on each other and also to protect maps from possible injury when the mounts are folded back. They are installed on every other frame. These are easily shaped in a vise.

(Continued on page 71)



● SOME of the details described in the text are shown in these drawings of the map rack.



What You Should Know — ABOUT

H. C. JESTER

Chief Chemist, Paint Section,
Research & Technical Division,
Joseph Dixon Crucible Co.

ONE of the least understood phases of municipal maintenance and, at the same time, one of the most important, is the proper and adequate protection of water tanks and standpipes. This is not only a matter of protecting the municipality's investment in the tank, nor of preventing failure and possible damage to life and property; it is also a matter of fire insurance finance. Good tanks, properly maintained, mean lower insurance rates. The difference in insurance rates may cover the cost of keeping elevated storage in good repair.

The first step in setting up a good maintenance program is to establish a regular inspection schedule. Experience indicates that this should be a regular annual chore. While it is true that tanks last from 10 to 50 years, the annual inspection will bring to light such conditions as small leaks, slight pitting and incipient paint failure early enough so that the conditions can be economically rectified before they spread and become both serious and costly.

Inspection of the exterior should include the supporting legs of the tower, the tank riser, and the exterior of the tank itself. Special attention should be given to the sway rods, and adjustments should be made annually to keep them tight. This in itself will go a long way

towards eliminating stresses and strains that eventually cause leaks and even rivet failure.

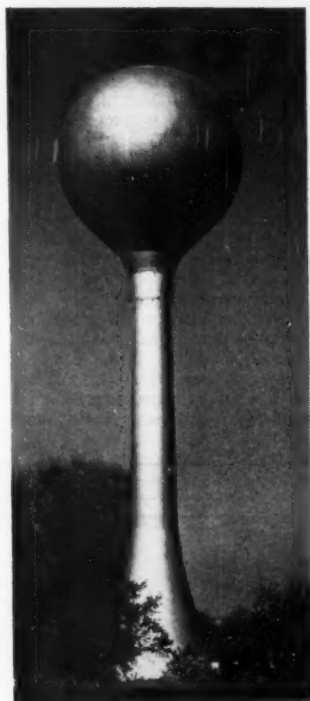
The tank interior can be easily inspected through the use of a small rubber inflatable raft. The type used by the Army Air Force during the last war is especially useful here, as it contains its own inflation mechanism, and can be dropped through the roof hatch and then quickly inflated without the use of hand-pumps. This type of raft uses small replaceable cylinders of compressed gas as an inflant—usually CO₂. They are generally available through Army Surplus stores, and certain modified types manufactured for civilian use may be obtained through sporting goods outlets.

The tank interior should be gone over very carefully, with the water level adjusted to different depths so that the entire surface may be examined at close range. The interior surface will probably be covered with a coating of dirt and slime that may effectively hide the true condition of the old paint film. An ordinary kitchen scrubbing brush can be used to good advantage to clean spots here and there, so as to determine the actual state of preservation of the paint film.

Repairs and Surface Preparation

Before painting is started, necessary repairs should be made. This is a contract job and should be approached cautiously. The contract should define clearly the actual work to be done and the manner in which charges are to be made. Unfortunately there are still some un-

scrupulous companies that will undertake unauthorized work, running the cash far out of bounds; and some of them, in addition, will effect repairs of a very dubious quality. Above all, select a company that has a good reputation, require references, and check these references. Then see that proper specifications are included in the contract to cover the work that needs to be done and the method of paying for this work. (See final paragraph).



● ALUMINUM-graphite paint on tank is pleasing and durable.

After all needed repairs have been made, and the exterior surface of the tank shows no sign of leaking, surface preparation may be commenced. If the old paint film is in good condition, and is adhering tightly to the steel, it may be left on. However, all rust, loose mill

scale and loose and peeling paint should be completely removed right down to the actual steel plate. Wire-brushes, scrapers, emery cloth, sandpaper and chipping hammers are the most common of the hand tools employed. In addition, there are several electric and pneumatic scalers on the market which are ideally suited for this type of work.

In places where blisters or rust have occurred, the steel should be cleaned until it is bright. Wire

and fall, when extremes in temperature and humidity are not so pronounced.

However, a great deal of water tank painting is of necessity, and can be, done during the hot summer months, in spite of condensation. The heat of the sun will burn off the moisture on those surfaces where it strikes directly. Therefore, painting crews must "follow the sun" in their actual painting. In other words, one side of the tank

reason why a water tank cannot be painted any time from early spring all the way through late fall, just so long as the average prevailing temperatures are over 40° F. and local ambient conditions are favorable.

Painting

A film of paint on the surface of the water tank serves two important functions. It creates a pleasing appearance for the tank, thereby enhancing the immediate surround-

PAINTING WATER TANKS

brushes, scrapers and power sanding machines may be used advantageously for this application.

Before painting, the entire surface should be free of all foreign material, rust and loose paint. Whatever portion of the old paint film that is left should have a clean surface and be tightly bonded to the tank plates.

Application Conditions

Just as important in the long run as the thorough preparation of the surface and the selection of the proper paint is the matter of the weather conditions prevailing at the time the tank is painted. As in other types of outdoor structural painting, no paint should be applied when the temperature falls below 40°F. Nor should paint be applied to any steel surfaces that are not free of all moisture and frost. All painting activities should be either stopped or deferred in the event or even the immediate threat of rain.

One peculiar factor that applies to the painting of water tanks, and not to the painting of other large steel structures is the matter of excessive condensation. Water tanks, due to the large volume of water contained inside, are relatively slow to react to temperature changes. On a hot, humid summer day there may be from 10 to 30 degrees difference between the water inside the tank and the outside atmospheric temperature. This will cause moisture in the air to condense on the surface of the tank in small drops of water. This will prevent the proper bond of newly applied paint to the steel. For this reason much water tank painting is scheduled for spring

will dry first, and this is the side that should be painted first. As the sun gradually moves through its orbit, other portions of the tank surface will be dried out, and the painting crew can extend their operations into these newly dried areas. If a reasonable amount of care is combined with normal powers of observation there is no

ings, and, even more important, it prevents the formation of rust and corrosion that would eventually cause the tanks to fail. The degree of protection provided, within practical limits, is in direct ratio to the thickness of the final paint film. For this reason a two-coat painting system, and in some cases even a three-coat system, is highly desirable. In



● THIS light gray tank is an example of a well-maintained job.

the case of new tanks, being painted for the first time, the first coat should consist of an accepted primer followed by either one or two succeeding coats of slightly contrasting shades. Unless each succeeding coat is a different color than the preceding coat, it will be extremely difficult to spot the "holidays" in the film—or in other words, those places where the painters did not give complete coverage, and missed certain spots. Those holidays result in a thinner paint film at this particular spot, with a resultant sacrifice in ultimate durability.

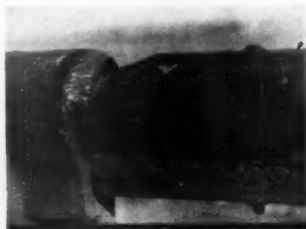
Generally speaking, most municipalities will find it advisable to contract for water tank painting. There are many factors in favor of this approach, rather than attempting the job with municipal personnel. In addition to the usual lack of manpower and tight "time table" to which all municipal jobs must constantly be adjusted, there are several other extremely important considerations. Foremost among these is the matter of skill and experience. Painting elevated water tanks and standpipes is not an easy thing. Greater than usual attention must be paid to details if the job is to be successful, and give lasting satisfaction. There is no latitude for mistakes. In addition, there is the matter of insurance. Experienced contractors are thoroughly familiar with public liability insurance, bonding procedures, etc., and if the contract is properly drawn, and the contractor is reliable, this will be the best method in the long run. However, it is important that those in charge thoroughly understand the problems involved, so that they may be in a position properly to outline the job, contract for it, and render the type of inspection that will insure the municipality's getting its money's worth.

In the case of new tanks, the fabricating and erecting companies are seldom interested in the final painting. However, through long experience in this field, and long association with the various service companies, they are usually in a position to recommend reliable painting contractors that specialize in this type of work. A sound procedure is to obtain the names of as many as possible, and contact them all.

One thing to bear in mind here is that the very nature of the tank painting business prevents it from being local. Tank painting companies operate over a wide geographical range. Therefore it is not wise to eliminate a company from your con-

sideration merely because it may be located a considerable distance from your city.

When the initial contract is made with the painting companies that are under consideration, one of the first steps is to obtain a list of the tanks that each contractor painted during the past year. A reliable and



● **POOR job of flux cleaning resulted in paint failure and rapid rusting near weld.**



● **PITS, not properly cleaned, will soon cause paint to peel.**

reputable contractor will not hesitate to supply such a list. A few of these jobs may then be checked, to make certain that they were done in a satisfactory manner.

Contractors that are not in a position to supply such a list may still be entirely reputable and dependable, but further investigation is definitely in order to determine the reasons for this inability to supply a list of past clients, before a contract is let.

Paint Selection

The final phase of obtaining long term protection at a minimum an-

nual cost is the matter of selection of materials. At this point a note of caution is in order. During the depression, some contractors employed tar and/or asphalt base coatings, instead of the more desirable oil paints. Even today, there are some firms that recommend this type of coating. It should be kept in mind that once this type of coating is put on, it is impossible to paint over it with oil paints, unless the surface is first subjected to a complete (and expensive) cleaning, employing such methods as sandblasting or flame cleaning.

Another point is the matter of specifications paints. Specification paints were drawn up to protect the user from inferior products that would not stand the test of time. When it is realized that the cost of the paint amounts to only about 1/5 of the total cost of the job, the importance of securing the best paint possible becomes readily apparent.

However, specifications are always minimum—not maximum. Taking a leaf from the books of the large, privately owned water companies, who must operate at a profit, and are therefore extremely conscious of costs and quality, and who employ top engineers in the water field to watch this very thing, we find a strong tendency to use proprietary (branded) paints, manufactured by reliable paint firms. Advantages are obvious here, as reputable manufacturers produce a product that is far superior to most specification paints, and market them under their own names. Their reputation is at stake, so every effort is made to supply a product that will give lasting satisfaction.

Here again, the manufacturer should be asked for a list of tanks on which his paint has been used. A few of these should then be checked, to make certain that the product is satisfactory for this type of service.

Another note here is the matter of colors. Bright colors are not necessarily the most enduring. This is especially pertinent in heavily industrialized areas, where gas concentrations tend to cause paint to deteriorate prematurely. Again taking a leaf from the book of the large private water companies, we find that the various hues of gray are frequently used. These shades also present a very pleasing appearance, in addition to being extremely durable.

Protecting water tanks is no job for the novice. The situation calls
(Continued on page 74)

UNIFORM HOUSE NUMBERING AND STREET NAMING SYSTEM



● PART of the center of Gallatin, showing N-S and E-W divisions and method of numbering.

ONE of the irritations of urban life is the waste of time and loss of patience resulting from unsystematic and haphazard house numbering and street naming. A method of street naming which gives no clue to the section of the city in which one's investigation should begin, and house numbers of nondescript design, successfully concealed behind obstructions, slow down the governmental and business operations of a city. Yet the citizens in thousands of American cities today seem reluctant to persuade their city officials to adopt a uniform system of property location. In some instances the legislative body of the city has met vigorous resistance to attempted change. Objections, frequently based upon minor points, run all the way from sentimental attachment to a particular street name to the refusal to discard a box of stationery printed with the old address.

Experience has demonstrated, however, that, once a city has adopted an orderly method of property numbering, the citizens usually accept the change and within a relatively short time become staunch advocates of their new system. This was the case in Gallatin, Tennessee, when, after two years of discussion

DANIEL S. MARTIN,

Regional Director, Middle Tennessee Office
Tennessee State Planning Commission

on the need for a uniform house numbering system, the city council finally acted to correct the confusing situation. A complete system was adopted, numbers installed, and many streets renamed. A publicity campaign was carried on to explain the new system to the residents, and as a result, with the exception of a small group of chronic complainers and a few people who did not understand how the system worked, the change was enthusiastically accepted by the population.

Certain problems encountered in the Gallatin numbering project are common in many cities of the 5,000 population class which attempted to adopt a system which will facilitate address location. Similarly, it is probable that the solutions to some of these problems in Gallatin have equal application in other cities.

Local Conditions

Gallatin, Tenn., located 23 miles northeast of Nashville, is typical of many small cities. In 1880 the United

States Census reported the population at 1,938 persons. Growth was fairly uniform during the ensuing seven decades with the 1950 population reported at 5,102. Unregulated developments in Gallatin over a period of years resulted in a haphazard street pattern with numerous dead-end streets, confusing and duplicating street names, and in some cases, construction of dwellings on the inside of blocks with no street access whatsoever. Prior to the adoption of the new system about one third of the houses and buildings were numbered, but there was little semblance of a numbering system, and property location became more and more of a problem as one proceeded away from the central city square. The post office, the business men, the local chamber of commerce, the telephone and telegraph companies, the city fire department and water department—all united in an appeal to the city council for reform.

The first action of the city council was to refer the problem to the city planning commission for study and recommendations. The city planning commission contacted the representative of the Tennessee State Planning Commission and asked for technical advice and as-

sistance. In Tennessee, trained city planners, employed by the state, are available to cities upon request without charge. This state service makes it possible for small cities, which are unable to finance a planning assistance staff, to have the assistance of trained men in solving their local planning problems.

After studying the city base map in detail, and after a number of field checks, state planning technicians presented their recommenda-

tions to the city planning commission. The commission studied the proposal, instigated several changes, and went on record in their official minutes as approving the plan. The city council was then given the plan, together with a suggested property numbering and street naming ordinance, with the recommendation that the new system be adopted. The council reviewed the plan and adopted the ordinance with only one dissenting vote.



The System Adopted

In brief, the system which was adopted involves the use of existing street names where there is no duplication or confusion. All streets running generally in a north-south direction are designated as "avenues", and all streets running generally in an east-west direction are designated "streets." This proposal was one of the simplest methods for systematizing street naming in the city. It had the advantage of narrowing the search for a particular address to streets running in one direction—either north-south, or east-west, and to a particular half of the city. For example, an address of 420 North Water Avenue would indicate that the property faces a street or public way which runs approximately north-south located in the northern half of the city. This simple system gives uniformity to the street names by the mere addition of the suffix "avenue", or "street" to the existing street name. Minor streets of very short length are given the suffix "place" to differentiate them from the more important streets. Of course, in some instances it was necessary to change the street name as, for example, where streets were in continuous alignment but carrying several names; or where a street changed direction from say, north to east. This type of street naming system has worked out satisfactorily in Gallatin since the city is not large and the total number of streets comparatively few. An obvious disadvantage to this kind of system is that it is too general to be of much aid in locating streets easily and quickly in larger cities having hundreds of avenues and streets. However, our experience

does indicate that this approach can be counted on excellently in communities of under 10,000.

The Gallatin renumbering plan calls for the assignment of a separate number for every 20 feet of property fronting on a street. Study of the density of the city indicated it would be improbable that there would ever be need for more than 100 house numbers per 1,000 feet of street-front property. Also, the use of the twenty-foot numbering interval had another advantage which will be discussed later.

Base lines were established to divide the city into north and south halves, and east and west halves, and from these base lines, grid lines were imposed upon the map to indicate where the numbers would change from one hundred to the next higher hundred. An effort was made to place grid lines on the center line of existing streets so that grid number (commonly called block number) changes would occur at street intersections. It is understandable that the layman expects block numbers to change as he crosses street intersections, but it was not always possible to follow this scheme in Gallatin. The street pattern did not lend itself to this kind of treatment in all cases. A little thought on the subject will make it clear that a 20 foot numbering interval limits the distance between grid lines to 1,000 feet, and that within each 1,000 feet there will be only 100 numbers—50 numbers for each side of the street. Consequently, if no cross street exists within 1,000 feet of the preceding grid line, it will be necessary to locate the grid line arbitrarily in order to keep within the 1,000 foot

maximum limit. This procedure results in changing block numbers in the middle of long blocks but actually little confusion arises from this cause.

The technical details of the renumbering were worked out by the state planning technicians. Large scale work maps of the city were prepared, house numbers were ordered, and the field workers were instructed in the work to be done. Other items needed for the job such as chalk, measuring chains, and colored pencils were ordered.

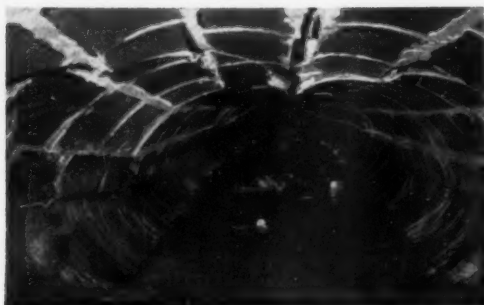
The field crews were composed of four men and one supervisor. Two men measured the distance along the curb or sidewalk and indicated with chalk the number of each interval. The supervisor followed the measuring crew assigning the appropriate number to each house. The number assigned depended upon the number of the interval in which the front entrance of the building fell. Odd numbers were given to the south and west sides of a street, and the numbers which were assigned were recorded upon the work map. Occupants of the buildings were given an instruction sheet informing them of their new house number and new street name with directions for obtaining and installing the numbers. In this manner two crews were able to complete the field work in six working days.

There finally remained the task of transferring the data on the work maps to an official map. This work was done on a map at a scale of 1" equals 200' made up in convenient size sections. Prints were made from this map and distributed to all city departments and other agencies concerned. The use of an interval of twenty feet in numbering the houses simplified the job of scaling the location of the buildings on the official map. For example, a building which had been assigned a number of 634 could be placed on the map by scaling 340 feet outward from the 600 grid line. The process involves dropping the first number (in this case, the 6) which indicates the grid number and adding a zero on the end.

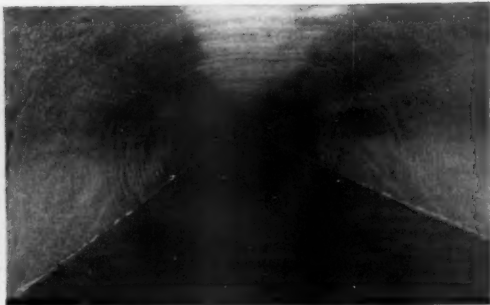
Suggestions For Improvement

Today in Gallatin, just a few months after the project was started, the property numbering system is working satisfactorily and serious objection to the change has almost disappeared. In reviewing the work on the project the Gallatin Planning Commission has listed several points

(Continued on page 72)



● ORIGINAL 44-inch sewer flattened out to 28" by 61", due to poor original construction.



● SECTION of 60-inch sewer after repair and relining by methods described in the article.

HOW STORM SEWERS WERE RELINED AND REPAIRED

SIDNEY LICKTON

Formerly City Engineer,
West Palm Beach, Fla.

SURVEYS of the storm sewers in West Palm Beach, Florida, showed that there were approximately 18,000 ft. of sewers that were in immediate need of repairs. The degree of repairs required varied from small openings in the joints of sewers, or small cracks along the springing line, top and bottom, to sewers which were on the verge of complete collapse.

The indirect effects of this were: The filling of the sewers with sand from infiltration to the point where they would no longer function properly, causing ponding in the streets; the settlement of street paving and curbing, from a few inches to as much as fourteen inches, making many street repairs necessary; and the complete failure of pavements, in two cases allowing vehicles to break through, causing injury, property damage and resulting legal suits against the city.

The main line sewers needing the repairs were laid in 1923 to 1926, the boom years. Apparently there was little or no inspection on the jobs, and the contractors were either rushing the work or were not of the high calibre of contractors now doing such work.

Attempts at Repair

Various methods of repairs had been used on different sections of

these sewers in order to defer necessary major repairs. In some places, attempts were made to patch crack and joint leaks from the inside. In other places the line was relaid with corrugated pipe, using the invert of the old pipe as a cradle; or corrugated pipe of smaller size was "threaded" into the existing pipe.

These methods had not proved completely successful or practical. The inside patching did not hold, or did not completely stop the infiltration of water. The cost of laying corrugated pipe in the cradle of the old pipe was high. The threading of a smaller pipe through the old pipe required street openings at 50 to 100 ft. intervals, and also reduced the flow capacity of the lines.

Two methods were suggested as an answer to the problem—guniting and cement machine lining.

Investigation and Plans

In order to ascertain what structural value a cement lining would have, a length of 30" vitrified clay pipe was broken under testing laboratory supervision. The broken pipe was put together and gunited with a 3/4-inch cement lining, allowed to set for seven days and rebroken. The lined pipe broke under 25% of the load required to break the pipe originally. It was reasoned that if a pipe in the ground were not completely collapsed, it must have some structural value. If all infiltration were stopped, thus allowing lateral soil pressure to be retained at the

springing line, and 25% of the original strength added, the sewer would be safely and adequately repaired.

Upon the recommendation of the City Engineer, the City Commission agreed to have the Centriline Corporation repair several sections of sewer.

Specifications were prepared and an agreement made on the basis of the costs shown in Table I. The lining of the 30-inch sewers was to be 1/2-inch thick; on all other sizes the lining was to be 1-inch thick. It developed that there were several sizes encountered that were not covered by this agreement, but a supplemental agreement was later made. Prices for these particular sizes were in line with those shown.

Table I.—Bid Prices for Lining Sewers

Size of Sewer	Reinforcing	Cost per Lin. Ft.
30-inch	none	\$2.80
42-inch	wire mesh	\$5.20
42-inch	none	\$4.30
48-inch	wire mesh	\$6.20
48-inch	none	\$4.75
54-inch	wire mesh	\$7.40
54-inch	none	\$5.20
60-inch	wire mesh	\$8.30
60-inch	none	\$5.80

Cleaning and Dewatering

The agreement required that the cleaning, desanding and dewatering of the sewers were to be done by City forces, while the actual stopping of leakage and the lining were

Table II.—Estimated Costs of Cleaning, Desanding and Dewatering

30-inch	\$1.80 per ft.
42-inch	\$2.20 per ft.
48-inch	\$2.50 per ft.
54-inch	\$2.80 per ft.
60-inch	\$3.00 per ft.

to be done by the Centrline Corporation.

The estimated costs of cleaning, desanding and dewatering the sewers were as shown in Table II.

On the first section of sewer that was lined, 950-ft. of 30-inch, the cost of cleaning and dewatering came within 5 cents a foot of the estimated cost. However, on another section of sewer, 870 ft. of 60-inch, the actual cost was two and one-half times the estimated cost. It was found that the difficulties in de-

3-inch centrifugal pumps were used simultaneously on one section.

It is obvious that in order to apply successfully a cement lining there can be no infiltration into the sewer. Water flowing from leaks will wash through the new cement before the lining is set. The stopping of this infiltration was and is a tough job.

Doing the Work

The ingenuity of the superintendent of the Centrline Corporation, Charles Erskine, in devising methods for this phase of the work, was remarkable. In some sections of the sewer the infiltration problem was solved by forcing grout through pipes placed in the wall of the sewer. The grout was made of high early strength cement, with an admixture of calcium chloride to produce flash setting. On other sections of the sewer, oakum caulking was used. In one section, the

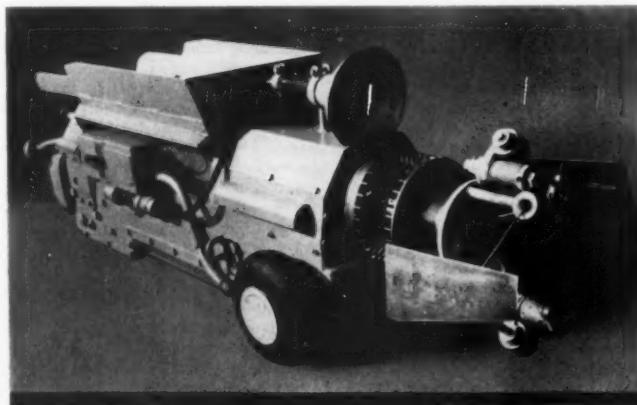
section was cleaned and dewatered on a fixed cost per foot basis; the other section on a cost plus basis. The cost plus basis proved most practical for the contractor and most economical for the city. Incidentally, the cost plus method was very close to the Engineer's estimate.

The work proved so successful that the 1950-51 budget set up approximately \$70,000 for continued sewer lining work. It is estimated that a four-year program of like size will complete all necessary sewer lining work.

During the first phase of the sewer repair program, a contract was let for lining, using the gunite method. It was soon learned that in sewers of less than 60 inches diameter, it is very difficult for a man to operate a gunite gun and obtain a uniform thickness of lining, as working space is lacking.

It was also found that some sections of the sewers were beyond repairing by any method and complete replacement will be necessary. Some sewers can be successfully repaired, even though badly damaged, provided a steel mesh is used in the lining. For such work 4" x 4" 10-10 mesh was specified and used successfully in several sections of such sewers.

It is the opinion of the writer that sewer lining work should be done when sewers first begin to show excessive infiltration and cracking. Prolonged delay results in numerous pavement surface failures and additional costs in the preparation of sewers for lining. Lining sewers at the proper time is far more economical than neglect which results in later extensive sewer and surface repairs and/or eventual necessary replacement.



● TYPE of lining machine used to place cement mortar lining in storm sewers after lines had been cleaned and repaired.

watering and cleaning the sewers could not be anticipated in advance of the actual work. Also, it was soon learned that the only practical method of removing the sand from a sewer was to shovel it into buckets, wheel it out on small carts to an open manhole and hoist it out. In a 500-ft. section of 60-inch sewer, 155 cu. yds. of sand was thus removed.

In order to dewater the sewer, it was necessary to build dams at both ends of the section, as in some cases the lower end of the section was below sea level. The catch basins were dammed with sandbags to prevent water entering. Because of the continual excessive infiltration as many as two 4-inch and two

leakage problem was solved by doing the work at low tide periods.

It was soon learned that the plan providing for city forces to do the desanding, cleaning and dewatering of the sewer would not be satisfactory. It was difficult for the contractor to plan the lining work intelligently, inasmuch as it was practically impossible to estimate the time required to clean and dewater the sewers. It was also determined that the work of stopping the infiltration into the sewer had to be done in conjunction with the dewatering.

It was then decided to repair two sections of the sewer with the contractor doing all of the work. One



● CAULKING leaks with oakum before relining.



● ABOVEGROUND portion of Middleville's deep well installation.

DEEP WELL REPLACES Subsurface Collection System

FOR many years, the Village of Middleville, Michigan obtained its water supply from a shallow open joint tile collecting system located at the foot of high terrain along the west bank of Thornapple River. Due to later home building on the area above the collection system, this source of supply became subject to serious potential sanitary hazards. It was therefore decided to investigate the possibilities of a deep well supply. The first well was put down near the collection system. Abundant water was obtained but the hardness was so great (1400 ppm.) that it had to be abandoned. Later investigations and study of the surrounding terrain indicated that an area southeast of the Village, along the opposite bank of the river, offered the best possibilities for a potable supply. Following a test well on this site, the permanent well produced 250 gpm. of good quality water with only a nominal hardness content.

Due to expansion of industrial activity and consequent increase of population from about 800 to 1,250 people, over a five-year period, it also became necessary to provide greater elevated storage capacity than was afforded by the existing 50,000-gallon elevated steel storage tank. Since the new well was located near the foot of high terrain east of the town, and a new main had to be built to connect to the existing distribution system, it was

apparent that consideration should be given to the construction of a reservoir on the high ground. Studies and estimates proved the feasibility and economy of building a 200,000-gallon capacity ground level concrete storage tank and 1,500 feet of 8-inch connecting main. Actual bid prices received for these two items of work amounted to \$33,400.

Details of Reservoir

The new storage tank is 50 feet in diameter with a sidewater depth of 14.5 ft. The 7-inch thick reinforced flat slab roof is supported by twelve

16-inch diameter columns. Outside walls are 12 inches thick, reinforced for hoop tension. The 6-inch reinforced concrete bottom slab slopes to a sump at the center of the tank which is provided with a 6-inch cast iron drain. A hot poured asphalt joint was placed between the vertical edges of the floor slab and inside face of the walls for water tightness. In order to provide for circulation of water within the tank from a single main, a wye fitting was installed in a manhole outside the tank with a check valve on the effluent branch which remains closed when water is being pumped to the tank. A flap valve installed on the end of the influent line at the inside face of the wall remains closed when water is discharged from the tank through the check valve, on the effluent branch. Both inlet and outlet branches of the main to the tank are provided with gate valves. An 8-inch diameter tank overflow with cast iron flap valve on outer end is installed as protection in event of failure of the automatic pressure type pump control. A concrete block baffle wall divides the tank in two parts for around-the-end circulation of flow from inlet to outlet. One large access opening with waterproof and locked cover, together with three 6-inch diameter screened vents, are installed in the roof.

The tank was built on a hillside in sand and gravel formation. The excavated material was used for forming an embankment around the down hill sides of the structure and covering the roof to a depth of three feet.

Getman Brothers of South Haven, Michigan were the contractors, and Clyde E. Williams & Associates of South Bend, Indiana, engineers.

Tractor and Back Hoe Speed Up Pipe Laying

C. I. Goff,

Sup't. Water Works, Preston, Idaho.

DURING the summer of 1950, Preston laid more than 15,000 ft. of 4-inch and 6-inch Transite water pipe, replacing old wood distribution lines that were laid in 1912. We used a Lorain ½-yd. back hoe to dig the trenches 4 ft. deep and about 30 ins. wide. This worked out very well as with this machine we could avoid damage to services and pass other obstacles by going over them.

We used a TLW Tractomotive

tractor for backfilling by changing the hookup on the front so as to convert our sidewalk snow plow to a bulldozer. This worked out very well, but it is only one of the jobs we use this tractor for. It is quickly convertible to a loader, and we used this for removing leftover dirt from the streets. Also, we have loaded thousands of yards of gravel for street work with this loader.

In connection with our water main laying, we set seven hydrants and we found we could use the tractor for lowering them in place more conveniently than we could set up a tripod for handling them.

How ORGANIZATION

JAMES D. HALWARTZ,

*Sup't. Water & Sewer Dep't.,
Winchester, Mass.*

WITH a population of 15,500, Winchester, Mass., has 68.04 miles of water pipe ranging from 4-in. to 24-in. In the system there are 1250 gates and 700 fire hydrants; there are 4081 water services, all of which, are metered; 24 fire sprinkler services; and 15 private hydrants. Two stations pump water from reservoirs to East High System. There is a standby pump to supply West High if the Metropolitan District Commission fails.

During the past year, 40.9% of the water used came from Winchester's own reservoirs, 35.5% came from the Metropolitan District Commission, and 23.6% came from Winchester Auxiliary Wells which consist of 24 2-in. wells. The average demand per day was 1,409,675 gallons with a minimum of 861,750 gallons, and a maximum of 3,437,550 gallons.

All of Winchester's water is chlorinated as a preventive and not as a cure. Calgon is used all year round, with very good success, to cut down rusty water. At all pumping stations and chlorination points duplicate units are installed so that, in case of breakdown of one unit, the standby unit can be put into service at once.

In the sewer system there are 54.36 miles of mains and 3800 house connections. There are five pumping stations. There is no treatment plant as all sewage is discharged into the Metropolitan District Trunk Sewer System.

In new construction work, the Town and the Department are saved considerable money and work by requiring a developer of a new section to install, at his own expense, sewer and water pipe. The town provides plans, specifications and inspection of work. By doing this, considerable undesirable development is kept out, as only reputable developers can afford to install water and sewer pipe. The practice also keeps down bond issues and saves bookkeeping of apportioned sewer assessments.

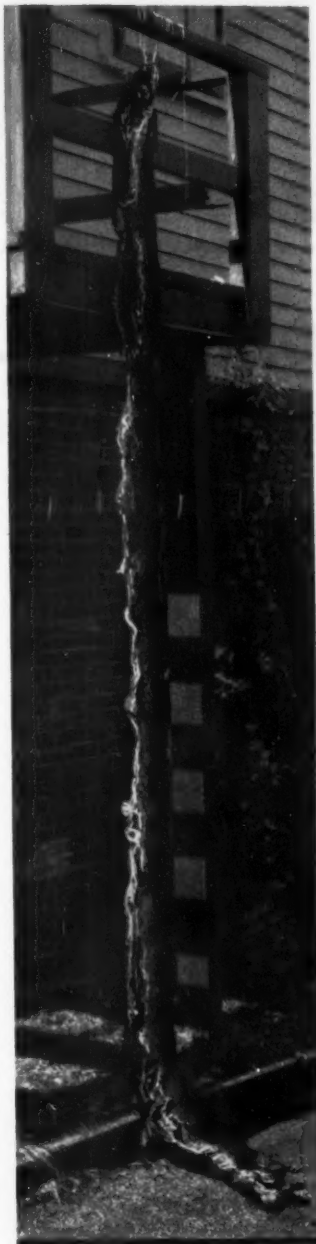
In the department there are 23

regular employees, but extra men are used in the construction season. For equipment, there are two ½-ton trucks; one in the meter department, and one for the assistant superintendent. The service foreman has a ¾-ton truck. The superintendent uses a ¾-ton truck equipped with two-way radio. The reservoir patrol uses a ½-ton truck equipped with two-way radio, fire extinguishers, brooms, axes, and shovels. There are three 1½-ton dump trucks, one with a front end pump for pumping trenches; and two 1½-ton platform trucks which are used for pipe hauling, carrying brush and by the Highway Department for plowing snow in winter.

For trench work, the department hires from a local contractor, a backhoe paying a daily rate or a per-foot rate depending on amount of work to be done. If ledge is found the department uses its own compressor to drill, and hires a contractor to blast. This saves the town the cost of bonding and law suits if damage is done. For bulldozer work, the department borrows from the Highway Department or hires if the Highway bulldozer is busy.

That Front-End Loader

Two years ago the department purchased an International Farmall Model M Tractor with a front end loader, and double acting hoist. This machine has many uses in the department. In backfilling trenches, large rock can be shoved away, whereas a bulldozer pushes everything into the trench. With its high lift, rock can be lifted out of the trench. With its close coupled front wheel and short turning radius, it can work closer to a trench than a wide wheel loader. Instead of setting up a stiff leg tripod to set hydrants, this machine picks up a hydrant from side of the trench, sets it in place and raises or lowers it in or out easily. In loading trucks with sand or gravel it is very fast. In the wintertime it is used to shovel out hydrants. If one cut is made on either side of the hydrant, there is plenty of room for the firemen to work. Around the shop yard there is an 8' fence. This machine dumps all the snow from the yard over the fence saving trucking. The Park Department uses it to dump snow from the skating rink over the boards. The Highway Department



● **THIS big one didn't get away.**
See text for details.

and EQUIPMENT

Speed Up City Work

uses it to load sand into the sand spreaders and load snow into trucks.

The department has two compressors. A 105 mounted on a truck is used on big jobs; a small trailer-mounted 95 is towed by any one of the trucks and is used mostly on service work. The use of a trailer compressor does not tie up trucks as it is left on the job, and the truck is available for other work. This is where the Superintendent's truck comes in handy; when the job is finished, he is able to move men and tools and hook up the compressor to the $\frac{3}{4}$ -ton truck and move them to another job. This saves running around looking for a truck and tying up other work to move the equipment.

The department has a 1500-watt generator with flood lights and necessary cable for extensions, all mounted on an old sedan chassis.

There is also a big generator with a 6-cylinder gas engine mounted on a $1\frac{1}{2}$ -ton chassis that is used in thawing out frozen services. As this unit is not in use by the department 99% of the time, the department has turned it over to the Highway Department for use as a welding unit.

The department has two 3-in. and one $1\frac{1}{2}$ -in. Homelite centrifugal pumps. The 3-inch pumps have a disadvantage in not being throttle controlled, and when working on a leak it is either all water or no water in the excavation. The $1\frac{1}{2}$ -inch pump has a throttle control and can be adjusted to handle the flow of water from a leak, making working conditions much easier. In a muddy ditch the diaphragm pump can't be beat, and the old hand pumps are still used. We are looking for a motor driven diaphragm pump.

Cleaning Sewers

In the Sewer Department, Flexible Rods are used. All equipment, reel, rods, cutters, augers, hooks, brushes, pullers, pipe, etc. is carried on a trailer. This is towed to the street where the sewer is to be cleaned and the truck is available for other work as the men can push the trailer easily. At the end of the day, the trailer is locked to a tree in the neighborhood or left in a yard, and the men picked up in a small truck. A Flexible power unit is also mounted on a trailer. This

equipment has done very good work in cleaning mains. It is not necessary to have as many workmen as when ropes and brushes were used. The Highway Department also uses this equipment to clean the storm drain lines. The Sewer Department also has two sets of house connection cleaning rods with necessary augers, cutters and spring cutters. These are kept in the shop and loaded on to a service truck when needed. We expect that our work of cleaning services and mains will be lessened by the use of Transite pipe in both mains and house connections.

Each street cleaned is noted on a master map. Streets which are bothersome are inspected monthly and cleaned every three months. Each service cleaned is noted in the Service Location Book as that is the first thing looked at before going on a stoppage. It has been recommended to the property owner to renew a service where there has been root trouble.

The department has purchased a $\frac{1}{2}$ -ton truck with a general service body. This truck will be used for meter work, and also night emergency work. The compartments will have bins for all small fittings, tools, meters, etc. Each one of our trucks carry gate keys, service keys, and hydrant wrenches.

We have all mains on plans 40 ft. to 1 in. filed at the shop, and a copy in the Engineering Department vault. They are up to date as of January 1, 1950. In view of what might happen, we are having half-size sets made up which will be on hand at two places in town. All water and sewer services are on plans in the shop office.

The Water and Sewer Board, as all other Boards in town, is made up of public spirited citizens who serve without pay. The chairman of the Water and Sewer Board, E. C. Sanderson, a retired Electrical Engineer, is the dean of town officials having served on the board for thirty five years, and as chairman thirty four years. Elwell Butterworth has served seventeen years. Mr. White has served three years. There are twenty three regular employees in the department.



● TRAILER feeds rods direct.



● SETTING hydrant with loader.



● TWO of the Homelite pumps.



● SERVICE truck carries pipe vise, keys, shovels and picks.

V-BELT DRIVES

in Public Works

FRANK J. DONAHUE

Applications Engineer, Texrope Drive Department,
Allis-Chalmers Mfg. Co., Milwaukee, Wis.

USE of V-belt drives in the public works field is widespread. This is particularly true in permanent installations such as municipal water works, pumping stations, sewage disposal plants, power plants and institutions. The applications are similar to those extensively used by industry for pumps, fans, blowers, compressors, generators, exciters, crushers, vibrating screens and many machine tools. Outdoor construction also calls for the use of V-belt drives on pumps, drill rigs, compressors, generators, crushers, screens, classifiers and many other devices driven by portable gasoline and diesel power units.

Under the circumstances, city, county and consulting engineers who have a basic understanding of V-belt drives enjoy an appreciable advantage through their ability to design, recommend and apply such drives where ordinary power sources are inadequate or unavailable. Similarly, this knowledge increases their capacity for training supervisory and operating personnel to maintain the efficiency of their V-belt drives, achieve satisfactory belt life and avoid costly shut-downs.

The following may serve as general guide posts to good V-belt drive design and operation:

Belt Speeds.—Minimum recommended belt speed is 1000 fpm; maximum recommended is 5000 fpm.

Belt Tension.—Since it is unlikely that facilities for measuring belt

tension will be available in the field, the following rule of thumb may be applied: (1) Move motor (driving machine) toward driven machine; place belts loosely in grooves of sheaves. (2) Move motor away from driven machine, turning sheaves to allow belts to settle in grooves. (3) Move motor farther away from driven machine to remove apparent slack; mark motor base and floor. (4) Move motor away 0.25 percent of the belt length measured from mark made on floor. This will give correct initial operating tension on the drive. (5) Since V-belts stretch in use, tension should be checked at intervals and maintained adequately to prevent slip. Neglect of tension will cause slip, reduce efficiency and shorten belt life.

Center Distance.—Recommended center distance is from one to two times the large sheave pitch diameter. Long center distances are objectionable because they require more tension and greater care of tension, they tend to whip with attendant risk of a snub break, and they take up more room and stretch more than short center drives.

Catalog Number.—Drives are described briefly, but clearly, by use of a Catalog Number. Example:

Catalog 4-C173-10.0-36.0, center distance 49.7".

4-C173 = Number, section and length of V-belts in the drive.

10.0" = Pitch diameter of driver sheaves in inches and tenths of an inch.

36.0" = Pitch diameter of driven sheave in inches and tenths of an inch.

49.7" = Center distance in inches and tenths of an inch.

In order properly to calculate or design a V-belt drive for a given application, certain data in tabular form must be available. Such tables and diagrams are published in the catalogs of the various manufacturers of V-belts and V-belt sheaves and are readily obtained from the Editor of PUBLIC WORKS or from the manufacturers or their local distributors. As a matter of fact, the city or county purchasing agent

probably has such catalogs in his files or can easily produce them for engineers without cost.

Solving a Problem

We shall now depart from the general considerations underlying good V-belt drive practice and proceed at once to a solution of a practical drive problem. This will illustrate the use of published data and the various steps in arriving at a suitable drive. Assume that we have been asked to figure a V-belt drive for use between a 10-hp squirrel cage motor operating at 1,750 rpm full load speed and a ventilating fan at 276 rpm.

$$\begin{aligned} \text{1. Speed Ratio.} \\ \text{RPM High Speed Shaft} &= 1750 \\ \text{RPM Low Speed Shaft} &= 276 \\ &= 6.34 \text{ (Ratio).} \end{aligned}$$

2. Drive Horsepower Required.—Multiply hp rating of motor by the service factor S.F. found in Figure 1 accompanying this article—10 hp. $\times 1.2 = 12 \text{ hp (required).}$

FIG. 1 - SERVICE FACTORS

Following are some of the more general applications with corresponding Overload Factors. (Reversing service or Across-the-Line Start Motors require an additional 1.2 overload factor.)

Agitators, paddle-propeller	1.0-1.2
Compressors	1.2-1.4
Conveyors	1.0-1.6
Crushing Machinery	1.4-1.6
Fans and Blowers	1.2-2.0
Generators and Exciters	1.2
Line Shafts	1.4-2.0
Machine Tools	1.0-1.4
Pumps	1.2-2.0
Screens	1.2-1.4

The Service Factor selected depends on peak and shock load in excess of 100% full load. Where shock and peak loads are light, use the lower Service Factor — for severe loads, use the higher Service Factor.

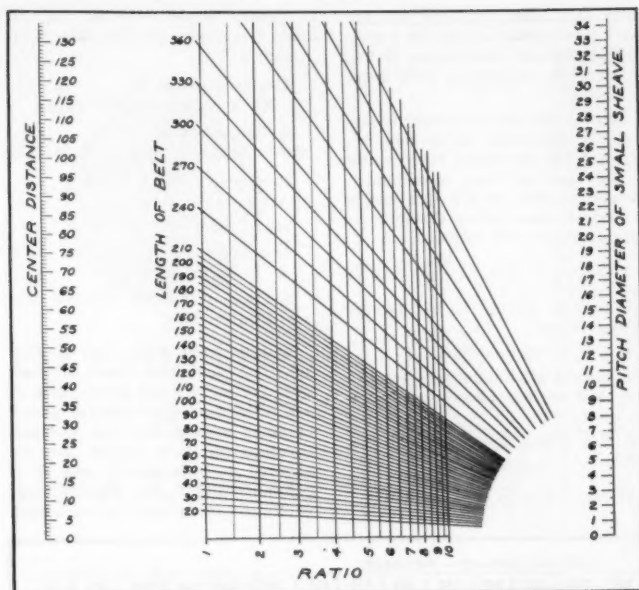
3. Belt Section.—From Figure 2, select recommended belt section. "B" section is selected.

NORMAL HORSE POWER	MOTOR SPEED			
	1750	1200	900	750 and below
1/2 to 1 1/2	A B B	A B B	A B B	A B B
1 1/2 to 3	A B B	A B B	A B B	A B B
3 to 10	A B B	A B B	A B B	A B B
10 to 20	A B B	A B B	A B B	A B B
20 to 30	A B B	A B B	A B B	A B B
30 to 40	A B B	A B B	A B B	A B B
40 to 50	A B B	A B B	A B B	A B B
50 to 75	A B B	A B B	A B B	A B B
75 to 100	A B B	A B B	A B B	A B B
100 to 150	A B B	A B B	A B B	A B B
150 to 200	A B B	A B B	A B B	A B B
200 to 300	A B B	A B B	A B B	A B B
300 and over	A B B	A B B	A B B	A B B

FIG. 2. Belt section chart.

Characteristics of V-Belts

Belt Section (Top Width)	Tension per Belt (Theoretical)	Min. Pitch Dia. Recommended
A-1/2"	40#	4.0"
B-21/32"	75#	6.0"
C-7/8"	125#	10.0"
D-1-1/4"	230#	14.0"
E-1-1/2"	380#	24.0"



● FIG. 3. This belt selection chart shows length of belt needed.

4. Sheave Pitch Diameters.—With slide rule set at speed ratio, select sheave pitch diameters such that small sheave is at least the recommended minimum P.D. for B section belts as shown in the "Characteristics of V-belts". Thus, taking 6 in. P.D. on scale C, the large sheave P.D. is read immediately below on scale D as 38 inch. The motor sheave will be 6 inch P.D. and the fan sheave 38 inch P.D.

5. Select Belt Length and Calculate Center Distance.—A. On belt selection chart Figure 3, select approximate belt length for desired center distance (usually $1\frac{1}{2}$ to 2 times P.D. of large sheave). Assume desired center distance to be about 60 inches. Lay straight edge on chart (Fig. 3) from small sheave P.D. at right edge of diagram to 60-inch center distance at left edge of diagram. Reading up from ratio 6.34 (approx.) at bottom of diagram to straight edge find diagonal line of nominal length 195 inches.

B. Refer to stock belt table (Fig. 4) and select B belt nearest to 195 inches length. This is B195 whose pitch length is 196.3 inches.

C. Divide P.D. of small sheave by pitch length of belt, obtaining sheave

$$\frac{6.0}{196.3} = .0305 \text{ (Sheave Factor).}$$

factor:

Section A		Section B		Section C		Section D	
Serial No.	Pitch Length	Serial No.	Pitch Length	Serial No.	Pitch Length	Serial No.	Pitch Length
A85	85.9	B95	95.3	C91	91.6	D188	188.4
A90	90.0	B100	100.0	C96	96.4	D193	193.4
A95	95.0	B105	105.1	C101	101.2	D198	198.4
A100	100.0	B110	110.2	C106	106.0	D203	203.4
A105	105.0	B115	115.3	C111	111.0	D208	208.4
A110	110.0	B120	120.4	C116	116.0	D213	213.4
A115	115.0	B125	125.5	C121	121.0	D218	218.4
A120	120.0	B130	130.6	C126	126.0	D223	223.4
A125	125.0	B135	135.7	C131	131.0	D228	228.4
A130	130.0	B140	140.8	C136	136.0	D233	233.4
A135	135.0	B145	145.9	C141	141.0	D238	238.4
A140	140.0	B150	150.0	C146	146.0	D243	243.4
A145	145.0	B155	155.1	C151	151.0	D248	248.4
A150	150.0	B160	160.2	C156	156.0	D253	253.4
A155	155.0	B165	165.3	C161	161.0	D258	258.4
A160	160.0	B170	170.4	C166	166.0	D263	263.4
A165	165.0	B175	175.5	C171	171.0	D268	268.4
A170	170.0	B180	180.6	C176	176.0	D273	273.4
A175	175.0	B185	185.7	C181	181.0	D278	278.4
A180	180.0	B190	190.8	C186	186.0	D283	283.4
A185	185.0	B195	195.9	C191	191.0	D288	288.4
A190	190.0	B200	200.0	C196	196.0	D293	293.4
A195	195.0	B205	205.1	C201	201.0	D298	298.4
A200	200.0	B210	210.2	C206	206.0	D303	303.4
A205	205.0	B215	215.3	C211	211.0	D308	308.4
A210	210.0	B220	220.4	C216	216.0	D313	313.4
A215	215.0	B225	225.5	C221	221.0	D318	318.4
A220	220.0	B230	230.6	C226	226.0	D323	323.4
A225	225.0	B235	235.7	C231	231.0	D328	328.4
A230	230.0	B240	240.8	C236	236.0	D333	333.4
A235	235.0	B245	245.9	C241	241.0	D338	338.4
A240	240.0	B250	250.0	C246	246.0	D343	343.4
A245	245.0	B255	255.1	C251	251.0	D348	348.4
A250	250.0	B260	260.2	C256	256.0	D353	353.4
A255	255.0	B265	265.3	C261	261.0	D358	358.4
A260	260.0	B270	270.4	C266	266.0	D363	363.4
A265	265.0	B275	275.5	C271	271.0	D368	368.4
A270	270.0	B280	280.6	C276	276.0	D373	373.4
A275	275.0	B285	285.7	C281	281.0	D378	378.4
A280	280.0	B290	290.8	C286	286.0	D383	383.4
A285	285.0	B295	295.9	C291	291.0	D388	388.4
A290	290.0	B300	300.0	C296	296.0	D393	393.4
A295	295.0	B305	305.1	C301	301.0	D398	398.4
A300	300.0	B310	310.2	C306	306.0	D403	403.4
A305	305.0	B315	315.3	C311	311.0	D408	408.4
A310	310.0	B320	320.4	C316	316.0	D413	413.4
A315	315.0	B325	325.5	C321	321.0	D418	418.4
A320	320.0	B330	330.6	C326	326.0	D423	423.4
A325	325.0	B335	335.7	C331	331.0	D428	428.4
A330	330.0	B340	340.8	C336	336.0	D433	433.4
A335	335.0	B345	345.9	C341	341.0	D438	438.4
A340	340.0	B350	350.0	C346	346.0	D443	443.4
A345	345.0	B355	355.1	C351	351.0	D448	448.4
A350	350.0	B360	360.2	C356	356.0	D453	453.4
A355	355.0	B365	365.3	C361	361.0	D458	458.4
A360	360.0	B370	370.4	C366	366.0	D463	463.4
A365	365.0	B375	375.5	C371	371.0	D468	468.4
A370	370.0	B380	380.6	C376	376.0	D473	473.4
A375	375.0	B385	385.7	C381	381.0	D478	478.4
A380	380.0	B390	390.8	C386	386.0	D483	483.4
A385	385.0	B395	395.9	C391	391.0	D488	488.4
A390	390.0	B400	400.0	C396	396.0	D493	493.4
A395	395.0	B405	405.1	C401	401.0	D498	498.4
A400	400.0	B410	410.2	C406	406.0	D503	503.4
A405	405.0	B415	415.3	C411	411.0	D508	508.4
A410	410.0	B420	420.4	C416	416.0	D513	513.4
A415	415.0	B425	425.5	C421	421.0	D518	518.4
A420	420.0	B430	430.6	C426	426.0	D523	523.4
A425	425.0	B435	435.7	C431	431.0	D528	528.4
A430	430.0	B440	440.8	C436	436.0	D533	533.4
A435	435.0	B445	445.9	C441	441.0	D538	538.4
A440	440.0	B450	450.0	C446	446.0	D543	543.4
A445	445.0	B455	455.1	C451	451.0	D548	548.4
A450	450.0	B460	460.2	C456	456.0	D553	553.4
A455	455.0	B465	465.3	C461	461.0	D558	558.4
A460	460.0	B470	470.4	C466	466.0	D563	563.4
A465	465.0	B475	475.5	C471	471.0	D568	568.4
A470	470.0	B480	480.6	C476	476.0	D573	573.4
A475	475.0	B485	485.7	C481	481.0	D578	578.4
A480	480.0	B490	490.8	C486	486.0	D583	583.4
A485	485.0	B495	495.9	C491	491.0	D588	588.4
A490	490.0	B500	500.0	C496	496.0	D593	593.4
A495	495.0	B505	505.1	C501	501.0	D598	598.4
A500	500.0	B510	510.2	C506	506.0	D603	603.4
A505	505.0	B515	515.3	C511	511.0	D608	608.4
A510	510.0	B520	520.4	C516	516.0	D613	613.4
A515	515.0	B525	525.5	C521	521.0	D618	618.4
A520	520.0	B530	530.6	C526	526.0	D623	623.4
A525	525.0	B535	535.7	C531	531.0	D628	628.4
A530	530.0	B540	540.8	C536	536.0	D633	633.4
A535	535.0	B545	545.9	C541	541.0	D638	638.4
A540	540.0	B550	550.0	C546	546.0	D643	643.4
A545	545.0	B555	555.1	C551	551.0	D648	648.4
A550	550.0	B560	560.2	C556	556.0	D653	653.4
A555	555.0	B565	565.3	C561	561.0	D658	658.4
A560	560.0	B570	570.4	C566	566.0	D663	663.4
A565	565.0	B575	575.5	C571	571.0	D668	668.4
A570	570.0	B580	580.6	C576	576.0	D673	673.4
A575	575.0	B585	585.7	C581	581.0	D678	678.4
A580	580.0	B590	590.8	C586	586.0	D683	683.4
A585	585.0	B595	595.9	C591	591.0	D688	688.4
A590	590.0	B600	600.0	C596	596.0	D693	693.4
A595	595.0	B605	605.1	C601	601.0	D698	698.4
A600	600.0	B610	610.2	C606	606.0	D703	703.4
A605	605.0	B615	615.3	C611	611.0	D708	708.4
A610	610.0	B620	620.4	C616	616.0	D713	713.4
A615	615.0	B625	625.5	C621	621.0	D718	718.4
A620	620.0	B630	630.6	C626	626.0	D723	723.4
A625	625.0	B635	635.7	C631	631.0	D728	728.4
A630	630.0	B640	640.8	C636	636.0	D733	733.4
A635	635.0	B645	645.9	C641	641.0	D738	738.4
A640	640.0	B650	650.0	C646	646.0	D743	743.4
A645	645.0	B655	655.1	C651	651.0	D748	748.4
A650	650.0	B660	660.2	C656	656.0	D753	753.4
A655	655.0	B665	665.3	C661	661.0	D758	758.4
A660	660.0	B670	670.4	C666	666.0	D763	763.4
A665	665.0	B675	675.5	C671	671.0	D768	768.4
A670	670.0	B680	680.6	C676	676.0	D773	773.4
A675	675.0	B685	685.7	C681	681.0	D778	778.4
A680	680.0	B690	690.8	C686	686.0	D783	783.4
A685	685.0	B695	695.9	C691	691.0	D788	788.4
A690	690.0	B700	700.0	C696	696.0	D793	793.4
A695	695.0	B705	705.1	C701	701.0	D798	798.4
A700	700.0	B710	710.2	C706	706.0	D803	803.4
A705	705.0	B715	715.3	C711	711.0	D808	808.4
A710	710.0	B720	720.4	C716	716.0	D813	813.4
A715	715.0	B725	725.5	C721	721.0	D818	818.4
A720	720.0	B730	730.6	C726	726.0	D823	823.4
A725	725.0	B735	735.7	C731	731.0	D828	828.4
A730	730.0	B740	740.8	C736	736.0	D833	833.4
A735	735.0	B745	745.9	C741	741.0	D838	838.4
A740	740.0	B750	750.0	C746	746.0	D843	843.4
A745	745.0	B755	755.1	C751	751.0	D848	848.4
A750	750.0	B760	760.2	C756	756.0	D853	853.4
A755	755.0	B765	765.3	C761	761.0	D858	858.4
A760	760.0	B770	770.4	C766	766.0	D863	863.4
A765	765.0	B775	775.5	C771	771.0	D868	868.4
A770	770.0	B780	780.6	C776	776.0	D873	873.4
A775	775.0	B785	785.7	C781	781.0	D878	878.4
A780	780.0	B790	790.8	C786	786.0	D883	883.4
A785	785.0	B795	795.9	C791	791.0	D888	888.4
A790	790.0	B800	800.0	C796	796.0	D893	893.4
A795	795.0	B805	805.1	C801	801.0	D898	898.4
A800	800.0	B810	810.2	C806	806.0	D903	903.4
A805	805.0	B815	815.3	C811	811.0	D908	908.4
A810	810.0	B820	820.4	C816	816.0	D913	913.4
A815	815.0	B825	825.5	C821	821.0	D918	918.4
A820	820.0	B830	830.6	C826	826.0	D923	923.4
A825	825.0	B835	835.7	C831	831.0	D928	928.4
A830	830.0	B840	840.8	C836	836.0	D933	933.4
A835	835.0	B845	845.9	C841	841.0	D938	938.4
A840	840.0	B850	850.0	C846	846.0	D943	943.4
A845	845.0	B855	855.1	C851	851.0	D948	948.4
A850	850.0	B860	860.2	C856	856.0	D953	953.4
A855	855.0	B865	865.3	C861	861.0	D958	958.4
A860	860.0	B870	870.4	C866	866.0	D963	963.4
A865	865.0	B875	875.5	C871	871.0	D968	968.4
A870	870.0	B880	880.6	C876	876.0	D973	973.4
A875	875.0	B885	885.7	C881	881.0	D978	978.4
A880	880.0	B890	890.8	C886	886.0	D983	983.4
A885	885.0	B895	895.9	C891	891.0	D988	988.4
A890	890.0	B900	900.0	C896	896.0</		

= 0.92. Horsepower per belt times arc factor equals corrected horsepower rating for one belt. Thus, $3.6 \times 0.92 = 3.31$ hp/belt (corrected). This table, as presented in this article, is incomplete, and for all-around use the manufacturer's catalog should be consulted.

D. Dividing horsepower (step 2) by corrected horsepower per belt gives number of belts required for the drive. (If a fraction, use next higher number of belts). Thus, $12 \text{ hp} \div 3.31 \text{ hp} = 3.62$ or 4 belts required.

7. Catalog Number.—The complete drive may now be expressed as a catalog number: Cat. 4-B195-6.0-38.0 center distance 61.4".

The above detailed explanation may appear to be long and complicated. Actually, once the method is fully understood and provided the necessary data are at hand, it is

quite short. Let us work out another problem using just the necessary figures and calculations. It will be seen that it requires little space or time.

Assume that we are asked to figure a V-belt drive to operate between a 150-hp wound rotor motor at 870 rpm full load speed and a 36-inch crusher at 279 rpm and it is desired that center distance be approximately 130 inches.

1. Speed Ratio = $\frac{870}{279} = 3.12$.
2. Service Factor = 1.4; hp required = 210.
3. Use "D" section belts.
4. Sheave pitch diameters are 15.4 and 48.0 inches (these are stock sheaves).
5. Use stock V-belts serial No. D360;

$$\text{Sheave factor is } \frac{15.4}{360} = 0.0428;$$

Center factor is 0.360 (tabular data not shown for this determination);

$$\text{Center distance is } 360 \times 0.360 = 129.5 \text{ inches.}$$

$$\begin{aligned} 6. \text{ Belt speed is } 870 \times 0.262 \times 15.4 &= 3510 \text{ fpm;} \\ \text{Horsepower/belt} &= 18.6; \\ \text{Arc factor} &= 0.96; \\ \frac{150 \times 1.40}{18.6 \times 0.96} &= 11.73 \\ \text{or 12 belts required.} \end{aligned}$$

7. Catalog 12-D360-15.4-48.0 center distance 129.5"

Quarter turn drives can be supplied to function in place of angle gear (or mitre gear) drives, such as are often needed by standby power of pump installations. The problems involved in their design are not covered in this article and it is recommended that a manufacturer of V-belt equipment be consulted.

		ARC OF CONTACT — DEGREES																				
		90	100	110	120	123	125	128	130	133	137	140	142	145	150	152	155	160	164	168	170	176
Difference in Sheave Diameters		CORRECTION FACTOR FOR V FLAT DRIVES																				
		69	74	79	83	84	84	85	86	85	85	84	84	83	82	81	80	79	78	77	76	75
Inches		CORRECTION FACTOR FOR STANDARD V-DRIVES																				
		.69	.74	.79	.83	.84	.84	.85	.86	.87	.88	.89	.90	.91	.92	.93	.94	.95	.96	.97	.98	.99
1		0.7	0.8	0.9	1.0	1.1	1.1	1.1	1.2	1.2	1.3	1.4	1.5	1.7	1.9	2.1	2.4	2.5	4.7	4.7	4.7	4.7
2		0.7	0.8	0.9	1.0	1.1	1.1	1.1	1.2	1.2	1.3	1.4	1.5	1.7	1.9	2.1	2.4	2.5	4.7	4.7	4.7	4.7
3		0.7	0.8	0.9	1.0	1.1	1.1	1.1	1.2	1.2	1.3	1.4	1.5	1.7	1.9	2.1	2.4	2.5	4.7	4.7	4.7	4.7
4		0.7	0.8	0.9	1.0	1.1	1.1	1.1	1.2	1.2	1.3	1.4	1.5	1.7	1.9	2.1	2.4	2.5	4.7	4.7	4.7	4.7
5		0.7	0.8	0.9	1.0	1.1	1.1	1.1	1.2	1.2	1.3	1.4	1.5	1.7	1.9	2.1	2.4	2.5	4.7	4.7	4.7	4.7
6		0.7	0.8	0.9	1.0	1.1	1.1	1.1	1.2	1.2	1.3	1.4	1.5	1.7	1.9	2.1	2.4	2.5	4.7	4.7	4.7	4.7
7		0.7	0.8	0.9	1.0	1.1	1.1	1.1	1.2	1.2	1.3	1.4	1.5	1.7	1.9	2.1	2.4	2.5	4.7	4.7	4.7	4.7
8		0.7	0.8	0.9	1.0	1.1	1.1	1.1	1.2	1.2	1.3	1.4	1.5	1.7	1.9	2.1	2.4	2.5	4.7	4.7	4.7	4.7
9		0.7	0.8	0.9	1.0	1.1	1.1	1.1	1.2	1.2	1.3	1.4	1.5	1.7	1.9	2.1	2.4	2.5	4.7	4.7	4.7	4.7
10		0.7	0.8	0.9	1.0	1.1	1.1	1.1	1.2	1.2	1.3	1.4	1.5	1.7	1.9	2.1	2.4	2.5	4.7	4.7	4.7	4.7
11		0.7	0.8	0.9	1.0	1.1	1.1	1.1	1.2	1.2	1.3	1.4	1.5	1.7	1.9	2.1	2.4	2.5	4.7	4.7	4.7	4.7
12		0.7	0.8	0.9	1.0	1.1	1.1	1.1	1.2	1.2	1.3	1.4	1.5	1.7	1.9	2.1	2.4	2.5	4.7	4.7	4.7	4.7
13		0.7	0.8	0.9	1.0	1.1	1.1	1.1	1.2	1.2	1.3	1.4	1.5	1.7	1.9	2.1	2.4	2.5	4.7	4.7	4.7	4.7
14		0.7	0.8	0.9	1.0	1.1	1.1	1.1	1.2	1.2	1.3	1.4	1.5	1.7	1.9	2.1	2.4	2.5	4.7	4.7	4.7	4.7
15		0.7	0.8	0.9	1.0	1.1	1.1	1.1	1.2	1.2	1.3	1.4	1.5	1.7	1.9	2.1	2.4	2.5	4.7	4.7	4.7	4.7
16		0.7	0.8	0.9	1.0	1.1	1.1	1.1	1.2	1.2	1.3	1.4	1.5	1.7	1.9	2.1	2.4	2.5	4.7	4.7	4.7	4.7
17		0.7	0.8	0.9	1.0	1.1	1.1	1.1	1.2	1.2	1.3	1.4	1.5	1.7	1.9	2.1	2.4	2.5	4.7	4.7	4.7	4.7
18		0.7	0.8	0.9	1.0	1.1	1.1	1.1	1.2	1.2	1.3	1.4	1.5	1.7	1.9	2.1	2.4	2.5	4.7	4.7	4.7	4.7
19		0.7	0.8	0.9	1.0	1.1	1.1	1.1	1.2	1.2	1.3	1.4	1.5	1.7	1.9	2.1	2.4	2.5	4.7	4.7	4.7	4.7
20		0.7	0.8	0.9	1.0	1.1	1.1	1.1	1.2	1.2	1.3	1.4	1.5	1.7	1.9	2.1	2.4	2.5	4.7	4.7	4.7	4.7
21		0.7	0.8	0.9	1.0	1.1	1.1	1.1	1.2	1.2	1.3	1.4	1.5	1.7	1.9	2.1	2.4	2.5	4.7	4.7	4.7	4.7
22		0.7	0.8	0.9	1.0	1.1	1.1	1.1	1.2	1.2	1.3	1.4	1.5	1.7	1.9	2.1	2.4	2.5	4.7	4.7	4.7	4.7
23		0.7	0.8	0.9	1.0	1.1	1.1	1.1	1.2	1.2	1.3	1.4	1.5	1.7	1.9	2.1	2.4	2.5	4.7	4.7	4.7	4.7
24		0.7	0.8	0.9	1.0	1.1	1.1	1.1	1.2	1.2	1.3	1.4	1.5	1.7	1.9	2.1	2.4	2.5	4.7	4.7	4.7	4.7
25		0.7	0.8	0.9	1.0	1.1	1.1	1.1	1.2	1.2	1.3	1.4	1.5	1.7	1.9	2.1	2.4	2.5	4.7	4.7	4.7	4.7
26		0.7	0.8	0.9	1.0	1.1	1.1	1.1	1.2	1.2	1.3	1.4	1.5	1.7	1.9	2.1	2.4	2.5	4.7	4.7	4.7	4.7
27		0.7	0.8	0.9	1.0	1.1	1.1	1.1	1.2	1.2	1.3	1.4	1.5	1.7	1.9	2.1	2.4	2.5	4.7	4.7	4.7	4.7
28		0.7	0.8	0.9	1.0	1.1	1.1	1.1	1.2	1.2	1.3	1.4	1.5	1.7	1.9	2.1	2.4	2.5	4.7	4.7	4.7	4.7
29		0.7	0.8	0.9	1.0	1.1	1.1	1.1	1.2	1.2	1.3	1.4	1.5	1.7	1.9	2.1	2.4	2.5	4.7	4.7	4.7	4.7
30		0.7	0.8	0.9	1.0	1.1	1.1	1.1	1.2	1.2	1.3	1.4	1.5	1.7	1.9	2.1	2.4	2.5	4.7	4.7	4.7	4.7
31		0.7	0.8	0.9	1.0	1.1	1.1	1.1	1.2	1.2	1.3	1.4	1.5	1.7	1.9	2.1	2.4	2.5	4.7	4.7	4.7	4.7
32		0.7	0.8	0.9	1.0	1.1	1.1	1.1	1.2	1.2	1.3	1.4	1.5	1.7	1.9	2.1	2.4	2.5	4.7	4.7	4.7	4.7
33		0.7	0.8	0.9	1.0	1.1	1.1	1.1	1.2	1.2	1.3	1.4	1.5	1.7	1.9	2.1	2.4	2.5	4.7	4.7	4.7	4.7
34		0.7	0.8	0.9	1.0	1.1	1.1	1.1	1.2	1.2	1.3	1.4	1.5	1.7	1.9	2.1	2.4	2.5	4.7	4.7	4.7	4.7
35		0.7	0.8	0.9	1.0	1.1	1.1	1.1	1.2	1.2	1.3	1.4	1.5	1.7	1.9	2.1	2.4	2.5	4.7	4.7	4.7	4.7
36		0.7	0.8	0.9	1.0	1.1	1.1	1.1	1.2	1.2	1.3	1.4	1.5	1.7	1.9	2.1	2.4	2.5	4.7	4.7	4.7	4.7
37		0.7	0.8	0.9	1.0	1.1	1.1	1.1	1.2	1.2	1.3	1.4	1.5	1.7	1.9	2.1	2.4	2.5	4.7	4.7	4.7	4.7
38		0.7	0.8	0.9	1.0	1.1	1.1	1.1	1.2	1.2	1.3	1.4	1.5	1.7	1.9	2.1	2.4	2.5	4.7	4.7	4.7	4.7
39		0.7	0.8	0.9	1.0	1.1	1.1	1.1	1.2	1.2	1.3	1.4	1.5	1.7	1.9	2.1	2.4	2.5	4.7	4.7	4.7	4.7
40		0.7	0.8	0.9	1.0	1.1	1.1	1.1	1.2	1.2	1.3	1.4	1.5	1.7	1.9	2.1	2.4	2.5	4.7	4.7	4.7	4.7
41		0.7	0.8	0.9	1.0	1.1	1.1	1.1	1.2	1.2	1.3	1.4	1.5	1.7	1.9	2.1	2.4	2.5	4.7	4.7	4.7	4.7
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43		0.7	0.8	0.9	1.0	1.1	1.1	1.1	1.2	1.2	1.3	1.4	1.5	1.7	1.9	2.1	2.4	2.5	4.7	4.7	4.7	4.7
44		0.7	0.8	0.9	1.0	1.1	1.1	1.1	1.2	1.2	1.3	1.4	1.5	1.7	1.9	2.1	2.4	2.5	4.7	4.7	4.7	4.7
45		0.7	0.8	0.9	1.0	1.1	1.1	1.1	1.2	1.2	1.3	1.4	1.5	1.7	1.9	2.1	2.4	2.5	4.7	4.7	4.7	4.7
46		0.7	0.8	0.9	1.0	1.1	1.1	1.1	1.2	1.2	1.3	1.4	1.5	1.7	1.9	2.1	2.4	2.5	4.7	4.7	4.7	4.7
47		0.7	0.8	0.9	1.0	1.1	1.1	1.1	1.2	1.2	1.3	1.4	1.5	1.7	1.9	2.1	2.4	2.5	4.7	4.7	4.7	4.7
48		0.7	0.8	0.9	1.0	1.1	1.1	1.1	1.2	1.2	1.3	1.4	1.5	1.7	1.9	2.1	2.4	2.5	4.7	4.7	4.7	4.7
49		0.7	0.8	0.9	1.0	1.1	1.1	1.1	1.2	1.2	1.3	1.4	1.5	1.7	1.9	2.1	2.4	2.5	4.7	4.7	4.7	4.7
50		0.7	0.8	0.9	1.0	1.1	1.1	1.1	1.2	1.2	1.3	1.4	1.5	1.7	1.9	2.1	2.4	2.5	4.7	4.7	4.7	4.7
51		0.7	0.8	0.9	1.0	1.1	1.1	1.1	1.2	1.2	1.3	1.4	1.5	1.7	1.9	2.1	2.4	2.5	4.7	4.7	4.7	4.7
52		0.7	0.8	0.9	1.0	1.1	1.1	1.1	1.2	1.2	1.3	1.4	1.5	1.7	1.9	2.1	2.4	2.5	4.7	4.7	4.7	4.7
53		0.7	0.8	0.9	1.0	1.1	1.1	1.1	1.2	1.2	1.3	1.4	1.5	1.7	1.9	2.1	2.4	2.5	4.7	4.7	4.7	4.7
54		0.7	0.8	0.9	1.0	1.1	1.1	1.1	1.2	1.2	1.3	1.4	1.5	1.7	1.9	2.1	2.4	2.5	4.7	4.7	4.7	4.7
55		0.7	0.8	0.9	1.0	1.1	1.1	1.1	1.2	1.2	1.3	1.4	1.5	1.7	1.9	2.1	2.4	2.5	4.7	4.7	4.7	4.7
56		0.7	0.8	0.9	1.0	1.1	1.1	1.1	1.2	1.2	1.3	1.4	1.5	1.7	1.9	2.1	2.4	2.5	4.7	4.7	4.7	4.7
57		0.7	0.8	0.9	1.0	1.1	1.1	1.1	1.2	1.2	1.3	1.4	1.5	1.7	1.9	2.1	2.4	2.5	4.7	4.7	4.7	4.7
58		0.7	0.8	0.9	1.0	1.1	1.1	1.1	1.2	1.2	1.3	1.4	1.5	1.7	1.9	2.1	2.4	2.5	4.7	4.7	4.7	4.7
59		0.7	0.8	0.9	1.0	1.1	1.1	1.1	1.2	1.2	1.3	1.4	1.5	1.7	1.9	2.1	2.4	2.5	4.7	4.7	4.7	4.7
60		0.7	0.8	0.9	1.0	1.1	1.1	1.1	1.2	1.2	1.3	1.4	1.5	1.7	1.9	2.1	2.4	2.5	4.7	4.7	4.7	4.7
61		0.7	0.8	0.9	1.0	1.1	1.1	1.1	1.2	1.2	1.3	1.4	1.5	1.7	1.9	2.1	2.4	2.5	4.7	4.7	4.7	4.7
62		0.7	0.8	0.9	1.0	1.1	1.1	1.1	1.2	1.2	1.3	1.4	1.5	1.7	1.9	2.1	2.4	2.5	4.7	4.7	4.7	4.7
63		0.7	0.8	0.9	1.0	1.1	1.1	1.1	1.2	1.2	1.3	1.4	1.5	1.7	1.9	2.1	2.4	2.5	4.7	4.7	4.7	4.7
64		0.7	0.8	0.9	1.0	1.1	1.1	1.1	1.2	1.2	1.3	1.4	1.5	1.7	1.9	2.1	2.4	2.5	4.7	4.7	4.7	4.7
65		0.7	0.8	0.9	1.0	1.1	1.1	1.1	1.2	1.2	1.3	1.4	1.5	1.7	1.9	2.1	2.4	2.5	4.7	4		

THE PROBLEM

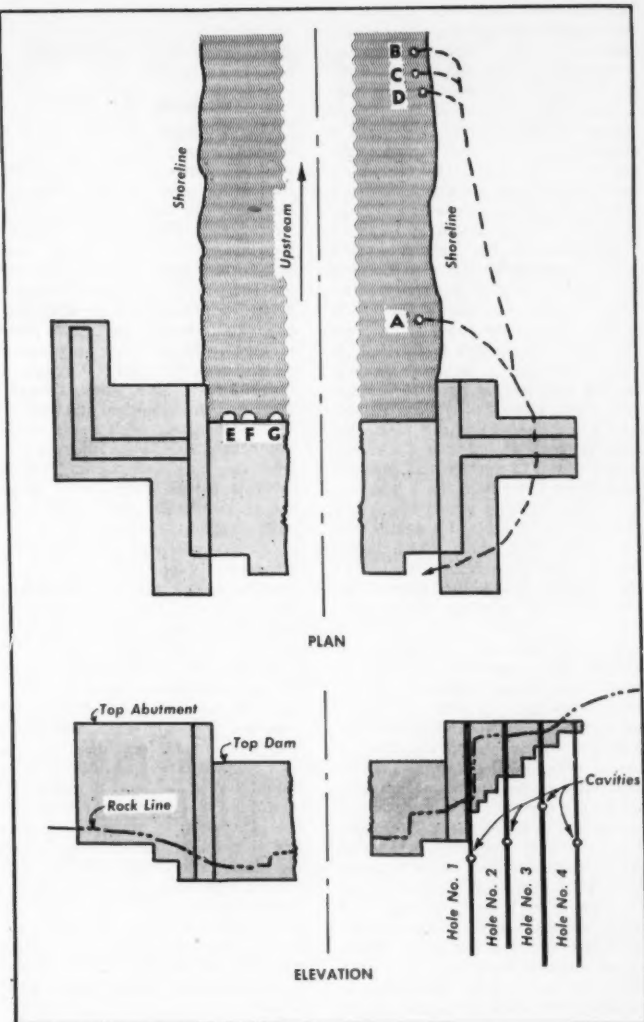
GROUTING A LEAKING DAM

HOLLA BURGESS,

Sup't. Water Dep't., Cookeville, Tenn.

UPON completion of our storage dam and subsequent filling in the fall of 1948 it was evident that too much water was leaving the dam. With no flow over the dam it was found when checking at a shoal immediately below the dam that a stream 4 feet wide and 4 inches deep was leaving. The engineers were notified and dye was put into the lake immediately above the dam. This dye showed up below the dam in some 20 minutes. It was suggested that we try wheat bran to see if it might not seal any crevices. Twelve bags of wheat bran were slowly put into the lake immediately above the dam with no apparent results.

Having met Sam J. Cunningham of Cunningham Core Drilling and Grouting Corporation of Salem, Virginia, who was doing considerable drilling and grouting at the nearby Center Hill dam, I invited him to look at our dam. He did this in the spring of 1950 and suggested that we wait until the leakage became worse or was endangering our water supply before attempting any repair. Mr. Cunningham did suggest that we try to locate approximately the source of the leak if possible.



● **PLAN and section of dam. A is location of whirlpool; B, C and D are other sinks; E, F and G are the sinks on west side of dam.**

At noon on June 30th, when flow over the dam had ceased, I took some dye and our crew out to the dam to test some probable places that might be leaking. Upon arrival at the dam it was noted that a stream approximately 2 square feet in area was coming around the east abutment. Upstream about 27 feet from the dam and 9 feet from the shore was a whirlpool. Dye placed in this whirlpool came through in 1½ minutes. An attempt to stop the flow was made by dropping 500 bags of earth into the whirlpool and by bull-

dozing a quantity of dirt onto them. These procedures did no good. Leakage was estimated at 2,000,000 gals. per day.

Starting the Work

Mr. Cunningham was called and arrived July 3rd. Upon arrival he suggested that we continue our efforts to check the flow by bagging so that he could economically grout it. The City Commission met with Mr. Cunningham and myself and a contract was drawn up employing his equipment and men on a labor

and materials basis with a rental on his equipment plus a percentage basis on the total cost. The drilling and grouting crew arrived July 10th. In the meantime, remembering that I had once discovered that I had "water witch" powers, I secured a peachtree fork and traced the source of the stream from the whirlpool around the abutment. When I told the drill foreman where to drill, he said: "Why?" I told him and he wanted to try the peachtree fork and it worked for him also. So hole No. 1 was drilled at this spot and an open cavity was hit at 21.8 feet down. The cavity was 1.3 feet through. Pouring dye in this hole it came through in 30 seconds. Not having material on hand for grouting, three more holes were drilled along the core from the abutment into the rock. In hole No. 2 a cavity was hit at 31.2 feet, which was 1.3 feet through. In hole No. 3 a cavity was hit at 31.2 feet which was 1 foot through. In hole No. 4 a cavity was hit at 34.5 feet which was only 0.8 feet through. Dye placed in each of these holes showed up around the abutment in varying periods of time.

Having secured a carload of cement and a quantity of minus 10 mesh agricultural limestone, an attempt was made to block the water by floating a 20' x 40' tarpaulin out over the whirlpool and weighting it down, after which approximately 1000 bags of sand were placed upon it. Then a quantity of dirt was bulldozed on the whole mass. The water was checked approximately half. An attempt was now made to grout hole No. 1 using a mixture of 1 bag of cement to 2 parts of the -10 mesh limestone with calcium chloride added to speed setting up. When grout began to wash out around the abutment an attempt was made to sandbag and hold the grout at the opening where the water was coming out, but the pressure was too great to hold the grout a sufficient time for it to set up. When the pressure built up, grout began to show in 2 or 3 more places immediately below the dam.

Another whirlpool was noticed some 80 feet above the first one. Taking the peachtree fork into action again it was found that there was a flow which led into the stream we hit with hole No. 1. Before further grouting, an attempt was made to block the places where the grout showed below the dam by bulldozing a quantity of dirt in, but when grouting was resumed the grout only worked its way up through the dirt. Mr. Cunningham now ad-

vised draining the lake before attempting any further grouting as there was an acute shortage of cement at this time.

Draining the Lake

Unfortunately our dam was built without a gate having only two 24-inch pipes through the bottom near the center with 20 bolts holding a bulkhead to each on the downstream side. These pipes were approximately 22 feet under water and at this depth pressure amounted to 4,300 pounds. In order to remove safely the bulkhead a temporary gate was fashioned out of two pieces of 4' x 4' 3/4-inch marine plywood, nailed back to back. Previous to lowering our gate we had tapped the pipe below the dam and inserted a 1" corporation cock so as to tell if the gate had taken the pressure from the bulkhead. Upon lowering the gate it was found that it would not go into place due to silt being built up against the dam.

A diver was called to place the temporary gate. Upon arrival he was feeling the effects of "Mountain Dew" and would not dive above the dam, as desired, to place the gate but said that he would remove the bulkhead. After considerable splashing and blubbing in water waist deep he came out with all bolts except the 2 bottom ones and water was gushing 10 feet high. He was at a loss what to do and said he would return the next morning and continue. When he did not appear the next morning we tried the gate and found that the silt had flushed out during the night and the gate sucked right into place stopping the flow of water. The two remaining bolts were removed and the temporary gate raised by truck winch and some 180 million gallons of water was let out of our reservoir in 3 days.

When the lake went down it was noticed that there was 3 sinks along the west half of the dam where water had been going under the dam. Holes were drilled across the dam at 20-foot intervals and along the west core from the abutment. With the water lowered, grouting was begun anew. A handful of dye was placed in the grout machine when starting on each hole and the position noted below the dam where it appeared. Then, during grouting, this spot was observed and when grout continued to come up at this spot we stopped grouting and moved to another hole following the same procedure. In some cases grout would cease to show below the dam and begin bubbling up in the stream bed

above the dam at several places. When this occurred generally we could never get this hole to take any more grout as the water pressure completely sealed the cavity when we moved from this hole. In some cases while grouting in one hole the grout would spout up in an adjacent drill hole showing that the crevices were interlinked. Crevices of some degree were encountered in every hole some 3 or 4 feet below the base of the dam. While grouting the dam proper we were careful not to build up over 50 pounds pressure for fear that the dam might be ruptured. Upon completion of the grouting of the holes at 20-foot intervals, check holes were drilled midway between these to see the extent of the grouting and to see if any other cavities were there. In most every case these check holes would not take other than water pressure and our previous grouting would show on the core.

Total Work Done

In all, 28 holes were drilled aggregating 1541 feet; 3200 bags of cement, 300 tons of -10 mesh limestone and 2 tons of calcium chloride were used in the grouting. This gave a total of better than 300 cu. yds. of grout pumped into the cavities for a total cost of approximately \$12,000.

Fortunately we had a hard rain on the third day following closing of the bulkhead and filled our lake in 24 hours. A close check was kept on an improvised weir at a shoal below the dam during filling and it was found that water only 15 inches wide and 3/4 inches deep was now getting away. This was from a spring immediately below dam. There is no evidence of leaking thus far and I am confident that we got a good job. And what a relief it was to get by with a drained lake in July without any water shortage.

Equipment for Painting Bridges

For painting bridges, L. R. Bennett, Superintendent, Steuben Co., N. Y., has devised a portable spray outfit. Nick Ludowese, Engineer, Grand Forks Co., N. D., has designed a compact and complete arrangement of a panel truck for survey work. John W. Dowler, Engineer of Athens Co., Ohio, has equipped a truck with a sand blaster and a paint sprayer for painting bridges. In Oregon, H. B. Brown, Engineer of Josephine County, has transformed an old truck into a crane for bridge and culvert work.

WHY A WHOLESALER?



A wholesaler is an indispensable factor in your welfare. He is the liaison between you, the buyer, and the manufacturer.

He serves as the local source for products which you can use to advantage, and brings them within your convenient reach. He can help you with installation problems; and questions put to him could be more quickly answered than would be possible if you went to the manufacturers direct. You can always go to him to obtain valuable information about the products you buy.

And of course, along with his constant endeavor to maintain complete stock assortments of kinds and sizes of his regular products, he is always abreast of the news and ever alert to any new developments and products that he thinks may bring you benefits.

Select a good wholesaler—and stick with him. He is in a most advantageous position to help you.

And in buying tube, select a good one—such as Wolverine—and stick to it. It's the quality-controlled tube that will deliver exceptional service.

WOLVERINE TUBE DIVISION, Calumet & Hecla Consolidated Copper Company, Incorporated, *Manufacturers of seamless, non-ferrous tubing*, 1451 Central Ave., Detroit 9, Mich. Plants in Detroit, Mich. and Decatur, Ala.

**BUY FROM YOUR
WHOLESALE**



When public works are being planned, the courts advise:

GET ENGINEERING ADVICE FIRST

PATRICK J. SMITH

IN making a topographical survey of a marsh area many years ago, one of the survey crew made a misstep. In moving from hummock to hummock in a peat marsh the crewman missed his footing and disappeared into a hole. Although a large excavation was made his body was never found. That was in 1898, yet it was of significance more than a half century later when a resident of Minneapolis sued the City, claiming that water seeping through the floor of his basement was caused by the negligence of the City in the construction and maintenance of improvements and particularly a storm sewer.

The Geologic Atlas of the United States for 1916 showed the area where the plaintiff's house was located as "one big swamp." There was a conflict in the facts as to whether there was a natural water-course through the area. In any event, the City in 1924 built a storm sewer to help drain this area. The sewer varied in diameter from 42 inches to 48 inches. It emptied into a lake through a submerged outlet. There was only a 4-ft. fall from the plaintiff's house to the lake. We are not told the distance. The engineers gave two reasons for the submerged outlet. One was an aesthetic reason since the lake was part of the park system; the other was lack of sufficient grade through the area drained.

Planning the Sewer

Prior to laying the storm sewer, test pits were sunk. One, a block from the plaintiff's house, showed 6 ft. of peat, 3 ft. of quicksand and 13 ft. of sand and gravel above a hard bottom. Another, a block on the other side of plaintiff's house from the first pit, showed less peat, some clay, no quicksand, and about 14 ft. of sand and gravel. The water in both pits came to within 2 ft. of the surface. Test pits sunk after the storm sewer was constructed showed a water level of 5.8 ft. below the sur-

face. The court pointed out that obviously the water level in the area had been lowered.

The basement floor of plaintiff's house was below the top of the storm sewer and only 6 ft. above the level of the lake into which the sewer drained. No complaint about the sufficiency of the sewer had been received by the city in over sixteen years. On the day that the plaintiff reported water seepage, the City received ninety-five other complaints of flooded sewers. The rainfall, in the 24-hour period, leading to the complaints, was in the neighborhood of 3 to 3½ ins.

The jury awarded the plaintiff \$850, but the trial court set the verdict aside. His main reason was that the rainfall was excessive and the damage was not caused by the City's negligence.

A majority of the Minnesota Supreme Court upheld the City. The court pointed out: "The improvements made by the City have lowered the water level to such an extent that the surface of a large part of the swamp has become usable for residential purposes. The only complaint plaintiff can make is that the municipality did not do more and wholly relieve the premises of surface and infiltrated water. . . ."

"The duty rests upon a municipality to employ competent engineers to plan and construct its system of streets and sewers, and ordinarily, if it thus acts, it is not liable because of errors of judgment therein. . . . No one questions the competency of the engineers who planned and constructed the municipal improvements. . . ."

We cannot disagree with the overall result. A swamp into which a man's body can sink irrecoverably is unlikely in fifty years to become a fit residence site.

"The Advice of Competent Engineers"

A city cannot be held liable for failure of improvements when it acts on the advice of competent engineers. This rule has been followed

by many courts. There are, however, many circumstances that must be taken into account before the rule can give insulation from liability.

A city that does not, however, seek competent engineering advice runs a substantial risk. If damage to private property results from this failure the city would be liable.

An Indiana Court said in this connection that: "It is their (the city officials') duty to use reasonable care to procure the services of men skilled in such affairs, and if they fail to exercise this care they are guilty of negligence for which the corporation must answer. Undertaking to exercise judgment without skill in a matter which requires skill is not a mere error of judgment, but it is negligence. . . . If, however, the municipal authorities do exercise reasonable care in securing the employment of fair care and skill, they are not guilty of negligence. If, after bringing into exercise reasonable care to select skilled persons, and in securing the exercise of their skill, there is still a defect in the system, it must be attributed, not to negligence, but to an error of judgment. . . . It is possible for a common council to act negligently in devising a plan, as well as in any other matter. If that body undertakes to prosecute a public work which requires a plan, and that plan can only be devised and prepared by skillful or experienced men, it would be negligence for it to undertake the work without exercising reasonable care to secure the assistance of such men. A prudent man certainly would not undertake a work of that character without the aid of competent men, and a city is held to substantially the same degree of care as individuals. . . . Deliberation on the part of the common council is futile unless the members have a fair knowledge of the matter which forms the subject of their deliberation. . . . If councilmen are not skilled in devising plans for sewers, no length of time in deliberation can establish the fact that due care was exercised." (Terre Haute vs. Hudnut, 112 Indiana 542).

Inadequacy Affects Liability

Palpable inadequacy of a sewer or drainage plan can materially affect liability. No competent engineer would advise an inadequate system. There is danger, however, if a sewerage or drainage system is proved to be inadequate and nothing is done to correct it. In cases where such has occurred courts have held municipalities liable for injury to private property.

The Wisconsin Supreme Court

THIS IS THE 4th

For a Big Industrial Plant in Memphis

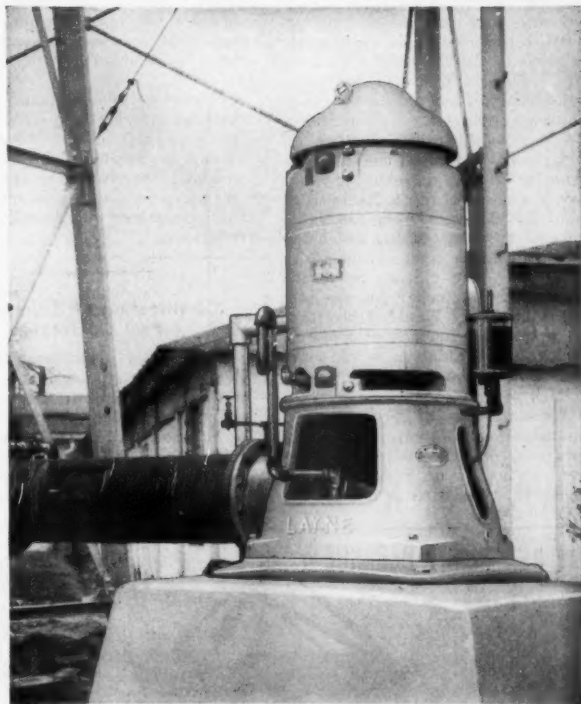
THE FIRST IN 1934 IS STILL PRODUCING ITS ORIGINAL CAPACITY

Seventeen years ago a big industrial plant of Memphis bought its first Layne well water supply system. World War II necessitated greater expansion which required two more Layne water supply units. Now the fourth has just been completed and is producing 1790 GPM whereas the contract guaranteed only 1500 GPM.

This is a typical case of where the first Layne installation proved to be so satisfactory that, as more water is needed, other Layne units are ordered as a matter of course. Certainly this industrial plant,—or any other big user of ground water, could make no finer investment.

Every Layne installation is a carefully engineered job from the original survey to the final testing. All have the same unmatched features of high efficiency, low upkeep cost and extra long life.

If you are considering the installation of a well water supply, a Layne engineer will be glad to make a study of your conditions. He will then recommend the type, size and overall capacity of a Layne unit—or units—that will best serve your water supply needs. There is no obligation.



4-TH LAYNE UNIT FOR AN INDUSTRIAL PLANT IN MEMPHIS



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Layne's new catalog on Short Coupled Service Pumps will be sent on request. It illustrates many varied and practical applications of these high efficiency pumps such as: pressure boosting, river intake, drainage, cooling, spray pond, fire, etc. Requests should be made on company letterheads.

Built Complete By Layne

The installation shown above—and all Layne well water supply units—are planned and installed complete by Layne's own field crews. All installations are under the constant supervision of Layne engineers which assures the owner of getting a tip top job from start to finish. Once installed, all Layne systems have the continued interest of Layne from whom any adjustment or repair can be obtained at any time.

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said: "A mistake of judgment in the adoption of a sewerage system is one thing, inexcusable omission to remedy demonstrated defects in one, liable, in view of the manner in which such system is designed to be used, to directly invade and injure private property, is quite another thing. The former involves mere error of judgment, the latter failure to perform a duty which the city owes to the persons whose property is liable to be so used." (Hart vs. Neillsville, 125 Wisconsin 546). This rule, however, has not found unanimous acceptance among the courts. Some view the problem as one of judgement and discretion to fix a time for altering or enlarging. They say if a municipality is liable to be sued for damages from failure to enlarge a sewer, is this not likely to substitute the judgment of a jury for that of the officials as to the expenditure of money for the best interests of all? Would it not force them to divert funds from a project which in their judgment would serve a greater number?

Each section of our country may differ in its views of liability against municipal corporations. Many factors can come into play to change the application of a rule of law. However, be all that as it may, the

safest procedure for governmental officials is to have available competent advisers. As a Delaware Judge once said to a jury: "I wish the jury to understand that what has been said with respect to immunity of the city from responsibility for error of judgment is meant to be confined to cases where competent persons—for example, a qualified city engineer—have been previously consulted, and have given an opinion which has been followed."

Competent engineering of the drainage system was a weighty factor in the case against Minneapolis. (Roche vs. Minneapolis, 223 Minnesota 359). Otherwise, the memory of the man who disappeared forever in the swamp hole might have made a difference.

Certification of Swimming Pool Operators

The Illinois Department of Public Health has announced a voluntary certification program for swimming pool operators whereby any Illinois pool operator upon application to the Department may be issued a certificate of competency, provided he meets the requirements.

The Department feels that such a program will result, not only in benefit to the health and welfare of each community and the promotion of better operation of swimming pools, but also will be a means of effecting for the pool operator recognition for experience, qualifications and the service he has rendered, which recognition ordinarily is not accorded him.

No swimming pool operator will be required to apply for a certificate of competency. The obtaining of such certificates is purely optional and voluntary, on the part of the pool operator. There are no assessments or fees necessary in obtaining such a certificate.

The classes of certificates to be issued are A, B, or C. To obtain the higher ratings of A or B the experience will have to be of a definitely responsible nature over a certain period of time. The Class C certificate will be issued to those with a minimum of two seasons' experience in the operation of an outdoor pool, or one year's experience in the operation of an indoor pool.

Applications received from operators will be reviewed and passed on by a committee consisting of several pool operators and the Chief Sanitary Engineer of the State.

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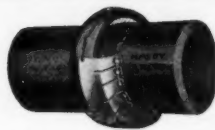
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TEST RESULTS ON SINGLE STAGE BIOLOGICAL FILTER

THE Water Pollution Research Laboratory of the Department of Scientific and Industrial Research, England, has been experimenting with percolating filters. In a recent paper by T. G. Tomlinson and H. Hall, results were reported of a study to determine "what single stage biological filters could achieve at different rates of dosage—mainly at rates much higher than those usually employed" in England.

The filters used for the purpose might be described as semi-works scale, for although fairly small, they were large enough to reproduce works conditions. Each of the eight filters was 8 ft. by 4½ ft. in plan and 6 ft. deep, and had a capacity of 8 cubic yards of filtering material. Each filter was fed by a travelling distributor, and each had its own humus tank situated below the filter.

Each filter was kept at a steady rate of dosage for a year, these rates ranging from 100 to 1000 gallons per cubic yard per day.

Grading of Medium

The practicability of high-rate single filtration for partial purification seems to depend to a considerable extent on the size of the filtering medium, for this proved to have much more effect on the continuity of operation and ease of maintenance than it had on the quality of the effluent.

Seven of the filters contained crushed gravel of the same grade, mainly ¾-in. to 1½-in. The other filter was filled with large gravel; the size of most of this material was from 1½-in. to 3-in. but about 7 per cent of it was between 3-in. and 4-in.

The coarse filter was operated at 600 gallons per cubic yard per day. As one of the other filters was worked at the same rate some useful comparisons are possible.

Results Obtained

The general picture of the chemical analyses is that, as the dosage rose from 100 to 1000 gallons per cubic yard per day, the quality of the settled effluents gradually deteriorated. This, of course, is what one would expect; however, the rate of deterioration occasioned by

the increased dosage was slower than might have been expected. Thus, at a time when the sewage had a BOD of about 160 ppm. the filter treating 100 gallons per cubic yard per day gave an effluent averaging about 22 ppm BOD. As the dosage increased so did the BOD; thus at 600 gallons per cubic yard per day the BOD of the effluent was about 40 ppm, and at a dosage of 1000 about 50 ppm.

Judged on "oxygen absorbed," the effect of increasing dosage was rather less pronounced. Taking the figures from the same columns as were used for the BOD results, we find that as the dosage increased from 100 to 1000 gallons per cubic yard per day, the OA of the effluent was about doubled. Thus, when the sewage had an OA of about 70 ppm the figures for the effluents from these two filters were about 15 and 30, respectively.

Ponding

However, there are other things to consider besides the analytical results, particularly those points

which affect the practicability of the process for works purposes. Important in this connection is the extent to which the various filters "ponded" and had to be forked over.

Dealing first with the seven identically graded filters, we find that the filter taking the lowest dosage (100 gallons per cubic yard per day) did not pond at all. As the dosage increased so did the ponding, until at the higher rates of dosage forking was necessary at intervals averaging about a month in length. This, by itself, is not very encouraging in regard to the practical use of the process.

However, we get a much more cheerful picture when we come to consider the behavior of the coarse filter. This gave effluents only slightly inferior to those from the finer filter working at the same dosage (600 gallons per cubic yard per day). There was, however, an enormous difference in the amount of ponding experienced with the two filters. During the year the surface of the finer filter had to be loosened by forking on about ten occasions; whereas the coarse filter (although it did a certain amount of ponding) was not forked at all—it cleared itself.

The forking of a high-rate filter not, relative to the volume treated, a very big job. Nevertheless, even after allowing for this fact, forking

High Brass at the WSWMA

Here is Frank W. Lovejoy of Socony-Vacuum Oil Company addressing 250 guests and members of Water and Sewage Works Manufacturers Association luncheon at Miami in May. Those at the table, left to right, are: John G. Stewart, manager of the Association; Edgar J. Buttenheim, who received a trophy upon completion of 23 years as treasurer; Mr. Lovejoy, Robert F. Orth, Everett M. Jones, and Richard Ford.

dressing 250 guests and members of ing were: Everett M. Jones, of Simplex Valve and Meter Company, president; Carl N. Brown of U. S. Pipe and Foundry Company, vice president; and Hubert F. O'Brien, of A. P. Smith Mfg. Co., treasurer.

Elected to the Board of Governors were: The Dorr Company, Pittsburgh-Des Moines Steel Company, The American City Magazine, Lock Joint Pipe Company, and Roberts Filter Manufacturing Company.



all over the filtration area ten to fifteen times a year is not an attractive prospect to a sewage works manager. The verdict, therefore, appears to be that single filtration at high rates could be used either as the first stage of a complete purification system, or by itself to produce effluents of lower than "Royal Commission" quality; and for these high-rate filters coarse filtering medium will be a better proposition than the finer grades.

Accumulation of Solids

It is worth noting that the "surface observations" were reinforced by determinations of the amounts of solid matter retained in the various filters.

The coarse filter, working at 600 gallons per cubic yard per day, retained almost exactly the same amount of solid matter as the filter dosed at 100 gallons per cubic yard per day. All the other filters were found to have accumulated considerably more solid matter, although the amount of solids present was not proportional either to the rate of dosage or to the number of forkings required. There is, however, nothing surprising in the fact that the ponding graph and the solids table do not correspond in detail. The solids figures were determined at the end of the experiments; this was in summer, when all the filters were frequently ponding.

Map Rack

(Continued from page 49)

A search for rubber rollers to fit the requirement ended in a bicycle repair shop. A length of rubber tire stock for tricycles was purchased and cut into $\frac{7}{8}$ -inch lengths. This material comes with a center hole of about 3/16-inch diameter and has worked out very nicely.

Painting, as called for on the plan, required green paint on all steel and the Homasote board. However, Superior primed the steel with a coat of aluminum paint and liked it so well that they decided to leave it that way. A special insulating board prime coat was put on the Homasote and then it was given a coat of green enamel (the aluminum painted steel frame was masked during the application of the green paint). This color combination is quite pleasing and undoubtedly imparts a sense of lightness to the heavy steel frame.

The entire map rack has been

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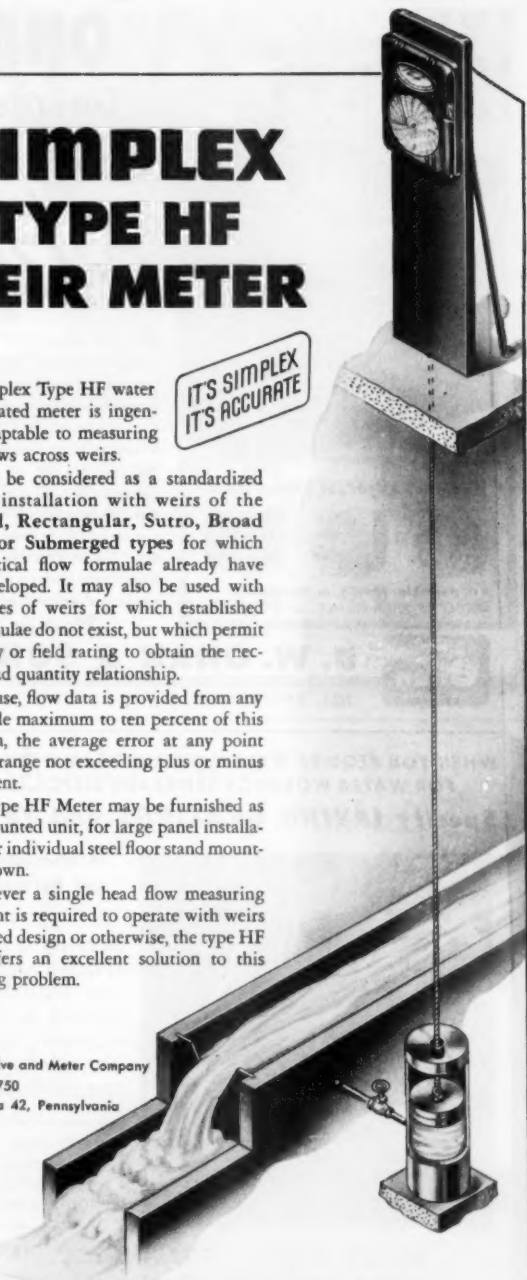
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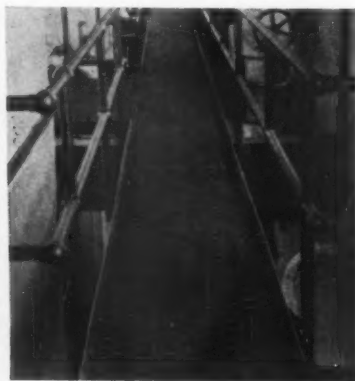


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moved to other rooms many times, and once to another building across town in a pick-up truck. The ease with which these moves have been made have proven the practicality of the take-down feature. The whole idea is certainly an improvement over the time-honored practice of rolling maps up and filing them where no one can find them.

Low Birdsall Retires

After a long and outstanding career in the water works field, Lewis I. Birdsall has retired. He has been with General Chemical for twenty-nine years. Following graduation from Williams in 1907, he did graduate work under Prof. Edward Bartow, was with the Illinois State Water Survey and in consulting engineering work. In 1912, he became superintendent of filtration at Minneapolis; and in 1922 started his career with General Chemical. His kindly personality, his wide knowledge and his willingness to help anyone needing help have combined to make him one of the most popular men in water works engineering. It is hoped that his retirement is a technicality and not a reality. It has been a pleasure to know him and to have received his assistance on many occasions.

Street Numbering

(Continued from page 54)

which might be of interest to other cities contemplating similar property numbering reform:

1. Have the field crews actually install the new numbers. In Gallatin, the field work was initiated before the new house numbers had been shipped. This made it necessary for occupants of buildings to come to the city hall to obtain the new numbers. This procedure resulted in delay and confusion. Many of the people lost their instruction sheets which were also the records of their new house numbers. The only other record of the newly assigned numbers were the work maps in use in the field. In some cases numerals were carelessly installed in incorrect sequence, resulting in an entirely different number than had been assigned.

It was concluded that these difficulties could be avoided by having the field crews install the numbers at the same time the number assignment is made.

2. If a change is to be made for the new house numbers, such billing should be made by mail, per-

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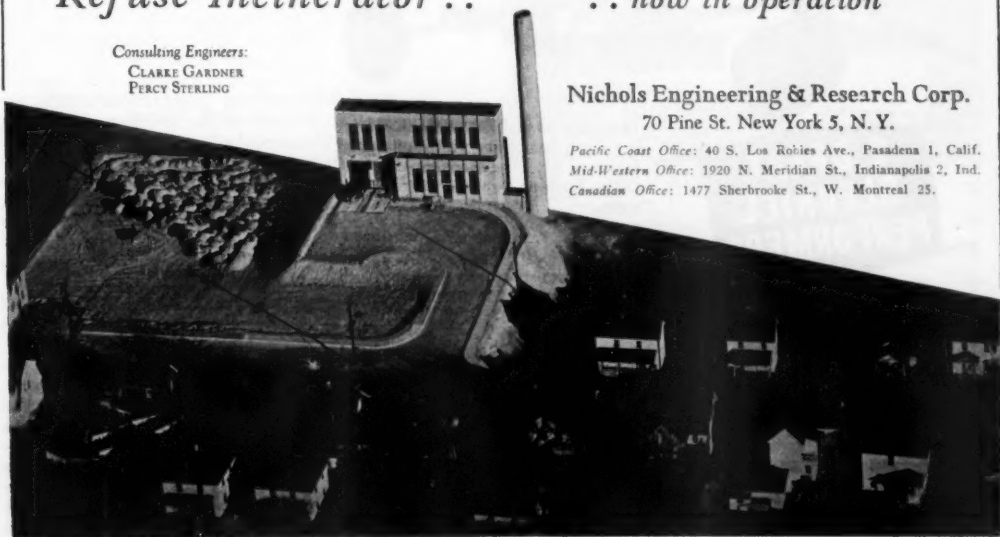
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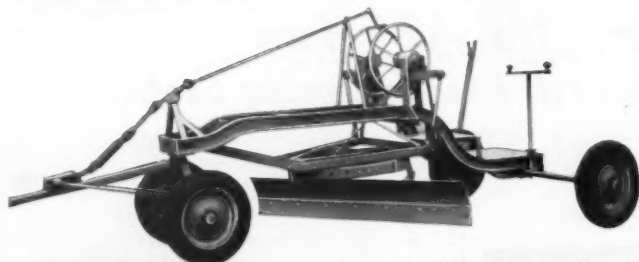
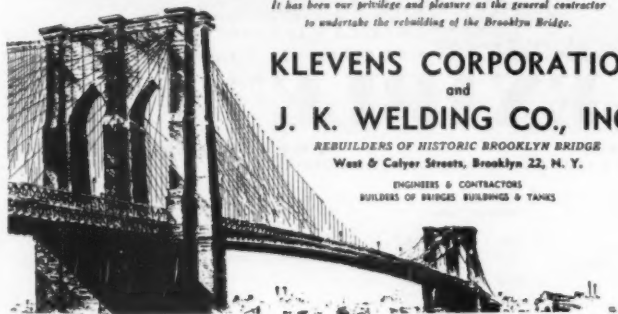
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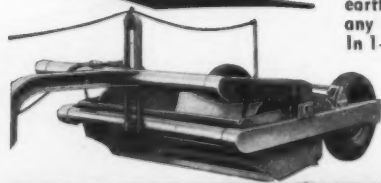
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happens through the water department. If field workers attempt to collect a charge for the numerals, there is the difficulty in maintaining proper records, and field work is slowed down considerably.

3. Engage a professional engineer to supervise the actual field work. A number of mistakes were made in Gallatin by inexperienced crews improperly supervised.

4. Advertise the project well in advance of the numbering change. In Gallatin it was the case of crying "Wolf" too many times. The people had heard so much about renumbering the city they didn't believe it would ever happen. Many business houses as well as private citizens were caught with a sizeable quantity of printed stationery when the new system went into effect.

5. The city council should publicly state its policy on the renumbering to make it abundantly clear that the new system will be followed. Without a clear statement of policy, rumors are easily invented to confuse the people and delay the change-over to the new system.

Painting Water Tanks

(Continued from page 52)

for the attention of experts, right from the outset. However, it is most important that municipal engineers thoroughly understand the principles involved, so that they will be in a position to contract properly for the work, and to render effective inspection. In addition, they should specify suitable materials, and then follow through to make certain that the contractor does not make any substitutions during the course of the job that will have a harmful effect on the life expectancy of the job.

A complete sample set of contracts, painting specifications etc., should be obtained by those in charge, as an aid to getting top dollar-value for every dollar expended. With this as a guide, you can be assured that your tanks will receive the proper maintenance and care at a minimum of cost.

As a service to the water field, the Joseph Dixon Crucible Company, Jersey City 3, N. J., has compiled a set of suggested contract forms and water tank painting specifications, embodying the principles found most valuable by the larger private water companies. These are available without charge, and may be had by writing to the above firm.

PUBLIC
WORKSENGINEERING
DATA

Roads Constructed While You Wait

RESearch to stabilize beach sand so that it will carry heavy traffic almost immediately and to develop methods that are rapid, simple and effective has been conducted by the Navy. In beach landing operations, it has been found that rubber tired equipment will bog down almost as soon as it passes the water line, creating a block to the advance of other equipment. For a unit landing operation, about two miles of roadway will be needed and this must be built quickly and be able to carry a load within a few hours after placement. The method must be applicable to any poorly graded beach sand.

The Navy Civil Engineer Corps Bulletin reports the progress of this research. Using a Wood road-mixer, remodeled, a speed of about 17 ft. per minute has been possible. The machine scoops up the beach sand, mixes it with aniline-furfural, spreads it and compacts it in a strip up to 12 ft. wide. The depth of the sand pickup and of the finished surface is a function of the power of the tractor pulling the mixer. This mixer has also been used on clay with success. In sand, a vibrator type compactor is better; in clay a smooth wheel roller is used.

The strips of stabilized beach sand, as laid, supported a jeep two hours after construction; a truck with a gross weight of 18,000 pounds three hours after construction; and a 38,000-lb. load eight hours after construction. The clay surface produced in this manner has supported a 50,000-lb. wheel load several days after stabilization.

Fluoridation Policy of Maryland State
Health Department

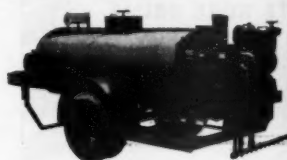
APPROVAL for fluoride treatment of public water supplies will be considered by the Maryland State Board of Health provided: (1) The dental and medical societies concur; and (2) fluoride is added and the dosage controlled as required by the Board. In the case of a private supply, the owner agrees to accept responsibility.

Requirements for fluoridation procedures have been issued by George L. Hall, Chief Engineer of the Board, as follows:

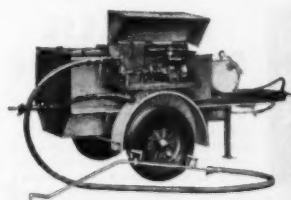
Application of Fluorine Compounds

Accurate feeding equipment must be provided for applying fluorine compounds. Either gravimetric or volumetric dry-feed equipment, or liquid-feed equipment, with an accuracy within 5 per cent, is required.

Special precautions must be taken to protect the operators from inhaling fluoride dust or fumes when handling these chemicals and when charging the

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feeders. It is recommended that dry-feeder hoppers be equipped with adequate dust collectors consisting of bag filters operating under positive air pressure and vented to the outside air. In the larger installations the dust collector system may discharge under water. Each operator who handles dry fluorine compounds shall be furnished with an individual toxic-dust respirator and rubber gloves to be used when handling the chemicals. When liquid-feed equipment is used, at least two solution tanks shall be available for the preparation and storage of the fluoride solution. The operators shall be provided with respirators, face shields, rubber gloves and protective clothing for use while preparing the fluoride solution.

Detail plans and specifications showing method and point of application of the fluorine compound and storage facilities for the chemicals shall be submitted to the State Department of Health for review and approval prior to installation. Information concerning technical supervision of the treatment process and laboratory facilities to be provided shall accompany the plans and specifications.

Control of Treatment Process

The treatment process shall provide a total concentration of fluoride in the water as delivered to the distribution system of 1.0 ppm with a maximum concentration of 1.5 ppm at any time. Qualified operators or laboratory personnel shall be responsible for conducting the necessary chemical analyses of the water and supervising the application of the fluorine compound. Samples of water must be collected and analyzed at frequent intervals from points before and after fluoridation and from one or more points in the distribution system. The frequency of sampling shall be determined by the State Department of Health and will depend upon the size of the waterworks system and the population served.

The method of determining the fluoride content of the water shall be in accordance with the latest edition of *Standard Methods for the Examination of Water and Sewage*. Accurate daily records of the amount of fluorine compound applied to the water and the result of all fluoride analyses shall be recorded on forms supplied or approved by the State Department of Health and shall be submitted to the Department weekly or monthly.

Price Trends on FA Highway Construction
Reported by BPR

AS measured by the price index for Federal-Aid Highway construction, prices have increased in the first quarter of 1951 as compared to the last quarter of 1950 and also for practically all previous periods. Common excavation was at 38 cents a yard, compared to 38 cents for the preceding quarter and an average of 34 cents for 1950. The bid price of concrete pavement was \$3.88 per sq. yd., compared with \$3.86 for the preceding quarter and \$3.66 average for 1950. Structural concrete was at \$50.12 a cubic yard, up from \$46.25 in the preceding quarter and from \$44.62 for 1950. The composite mile index was at 159.7, compared to 155.7 in the final quarter of 1950 and 145.7 for the 1950 average. On the 1940 base of 100, common excavation was at 182.4, concrete pavement 231.0, structural concrete 261.5 and the composite mile 215.9.

PUBLIC
WORKS

DIGESTS

This section digests and briefs the important articles appearing in the periodicals that reached this office prior to the 15th of the previous month. Appended are Bibliographies of all principal articles in these publications.

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SEWERAGE AND REFUSE . . .	92

THE WATER WORKS DIGEST

**A New Type of
"Dry" Filtration**

The ground-water supply of Zandvoort, Holland, requires removal of ammonia as well as iron and manganese. This was accomplished satisfactorily for a time by aeration and passing through coke beds and rapid pressure sand filters, but the filtrate had an oxygen content of only 3 ppm and there was a strong biological growth in the coke beds. Experiments resulted in the adoption of what is called "dry filtration," by which more oxygen is introduced into the filter bed. The filter outlet is so arranged as to lower the water level in the filters, and a reduced air pressure (partial vacuum) under the filter is obtained to ensure a constant downward flow of air through the filter. This process made possible a complete reduction of the ammonia, iron and manganese in a single filter phase, and with an oxygen content in the filtered water of 10%—practically the saturation point.

H. A. D. Linn—"New Type of 'Dry' Filtration Being Tried in Holland;" *Water Works Engineering*, April.

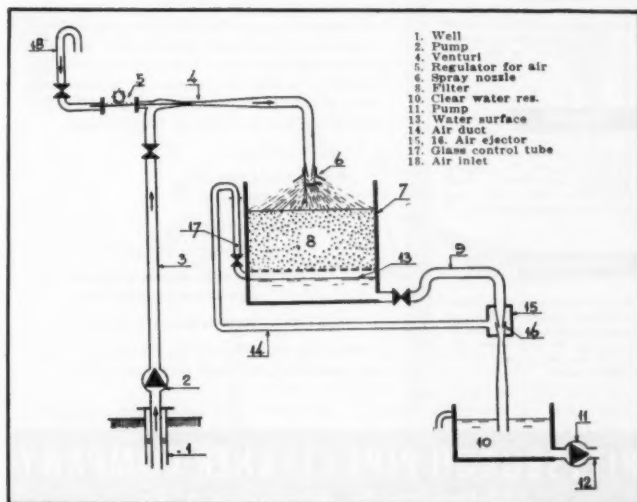
**Chlorination and
Anti-Corrosion Treatment**

Pilot plant studies made at the waterworks plant of Maynard, Mass., showed that there are many forces operating to cause corrosion and that it cannot be stopped by isolating and removing any single reaction or element. For the soft New England waters, the cheapest and most effective treatment is the limestone contact bed, lime or lime-soda ash treat-

ment. The chemicals used in treating a water to reach the carbonate saturation point are hydrated lime, unslaked lime, soda ash, caustic soda, and limestone. A disadvantage in the use of lime with some soft waters which contain very small amounts of CO_2 and bicarbonate alkalinity is that hydroxide alkalinity may result.

In waters containing relatively large amounts of organic matter, *Crenothrix* and *Leptothrix* are common, whereas in water low in organic matter *Gallionella* is prominent. These iron bacteria contribute to corrosion, although just how is undetermined; and the effective removal of these organisms and their

foods may solve a great portion of the problem. Residual chlorine is highly destructive of bacteria, but at a pH above 10, little if any of the residual is in the form of HOCl but is in the form of OCl^- , the bactericidal power of which is only about 1% of that possessed by hypochlorous acid. The introduction of chemicals for corrosion prevention raises the pH to 9.0-9.5, and the chlorine would have little effect on the iron bacteria. Therefore, before beginning the additions of chemicals for corrosion prevention, all growths, tuberculations of iron bacteria, slimes, etc., should be destroyed by high chlorine dosage and flushed out of the mains;



● **DIAGRAMMATIC section of new type filter used in Holland.**

Courtesy Water Works Engineering

and when these are clean, the treatment to calcium-carbonate saturation should be started immediately.

Werner N. Grune—"Experimental Break-Point Chlorination and Anti-corrosion Treatment at Maynard, Mass.," *Journal of New England Water Works Ass'n*, March.

Cost of Operating Construction Equipment

The Water Bureau of the Boston Metropolitan Dist. in the years 1948-1950 laid nearly 30 miles of main and installed about 3,000 services with its own forces. At first it hired the

heavy equipment used, but when it paid in one year nearly \$15,000 to rent a ¾ yd. backhoe and operator, it studied the matter of owning its own equipment. It therefore bought a 10-ton crane for handling pipe in the yard, three backhoes, and two front end loaders for backfilling, and kept cost records of operating them. These include all money spent for gasoline, oil, tires and repairs, and a complete overhauling of two of the backhoes. Averaging three years, each backhoe was used 1050 to 1300 hours per year. Adding depreciation and cost of operators to the operating

costs (but not including insurance or overhead), the cost per hour averaged \$5.11 for the three backhoes. The costs of the front end loaders, working about 1,000 hr. per yr., averaged \$3.43; and that of the crane, operated 400 hr., \$3.89. The current rental charges averaged \$8.50 for backhoes, \$7.00 for front end loaders, and \$8.00 for cranes. In addition to the savings due to ownership shown by these figures, the machines are always available at short notice at night and week-ends. However, it probably is better not to own unless a piece of equipment is used several hundred hours per year, since the depreciation continues anyhow. For example, one of the backhoes, if used only 380 hr. a year, would cost more than the rental charge for similar equipment, basing the depreciation on an estimated 6-yr. life.

Sherman L. Rogers—"The cost of Operating Construction Equipment," *Journal, New England Water Works Ass'n*, March.

Replacing Equipment

Equipment should generally be replaced when operating and maintenance costs exceed its productive value; its reliability cannot be maintained; or it is obsolete—i.e. when changes in other equipment or processes render it unsuitable, or it is inadequate in size, or other equipment would be more productive at lower cost. Reasons for not replacing at present may be lack of funds or of necessary operating personnel, or belief that prices will be lower or more productive equipment be available in the future. In many cases equipment can be improved in efficiency or economy of operation so as to improve or postpone the argument for replacement, such as trimming or replacing a pump impeller, cleaning a water main. To determine whether or how to replace, repair or modernize a piece of equipment, comparisons of possible methods should be made on the basis of annual cost per unit of output, including investment cost, depreciation, interest, operating expenses, maintenance, insurance, taxes, etc. Consideration should be given to salvage value; value of unit if retained as standby; cost of removal and of installing the new unit, inventories of spare parts which may or may not continue to have value.

W. Victor Weir—"When to Replace Equipment," *Water Works Engineering*, April.

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Dry Line Chlorination

The St. Louis water department has transported chlorine solutions from the control room to the point of application where this was less than 500 ft. away; but the pipe line was expensive and subject to breaks, and when transporting 2200 ft. became necessary, they decided to use a dry line instead. This consists essentially of a pressure regulator for the chlorine gas, a rotameter and a control valve in the control room; a steel pipe to carry the dry gas to the point of application; and an eductor at that point to pull the chlorine gas from the dry line and force it into the water through a short section of chlorine solution hose. It also includes a gas filter of spun glass, pressure gages at 4 points, and check valves at 3 points. The total purchase cost, exclusive of the steel pipe, was \$293.

A. V. Graf and E. E. Easterday—"St. Louis Dry Line Chlorinating System;" *Journal, American Water Works Ass'n*, April.

Fluoridation In the United States

From information supplied by the State Engineers of all 48 states and the D. C. it was learned that 41 states have adopted fluoridation policies; that 68 communities in 18 states are now using fluoridation, approval of it is pending in 68 other communities (some of them in 7 states other than the 18 referred to). In 24 states the effect on children is to be determined by periodic examination. The most generally used chemical is sodium fluoride. Recently a number of communities have become interested in using sodium silicofluoride. Hydrofluoric acid and hydrosilicofluoric acid have been used in a very few systems where special conditions prevail.

"How Far Has Fluoridation Developed in U. S.;" *Water Works Engineering*, April.

Repainting Steel Water Tanks

Outside surfaces of tanks are almost always protected by use of paint, although where corrosive conditions are acute, sprayed metal or hot coating may be used. Interior surfaces have been protected by cathodic protection, metallic coatings, wax or grease coatings, hot coatings and linings, cement linings, and paint. Paint is that most generally used. Sprayed metal is very

effective with corrosive water, but is very expensive. Wax or grease coatings are often very effective—a single application has been known to continue effective for more than 15 years. Materials such as coal tar, asphalt, and synthetic plastics and linings, applied hot, have proved to be excellent (though costly to apply), where paints are unsuitable. The same is true of linings of portland or other cements.

The secret of successful and economical paint protection is: 1—proper surface preparation; 2—suitable paint materials; 3—proper

application to required thickness; 4—proper maintenance of the paint film by annual inspection and repair. Sand blasting is generally the best and least expensive method of cleaning the surface. If this is not used, old paint can be removed by burning with a torch or by means of chemical paint strippers. At the end of each day, the area cleaned should be brushed with a coat of rust inhibitive primer. Spraying will produce a better paint coat than brushing if applied to a clean surface, but for a dusty surface, brushing is better. Also brushing is pref-



3-purpose part. Ingenious design is a feature of Mathews Hydrants—for example, use of a shield operating nut of high tensile iron. This serves three purposes.

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erable if workmen skilled in spraying are not available.

J. O. Jackson—"Repainting Steel Water Tanks;" *Water & Sewage Works*, April.

Efficiency of Activated Carbon

The efficiency of adsorption by activated carbon is influenced by numerous factors; among them, the pH value of the water. Therefore, the efficiency may be much greater if the carbon be added before lime, rather than after addition of lime has increased the pH value of the water. Adsorption normally occurs as soon as carbon establishes contact with the taste and odor bodies; but where the carbon dosage is relatively small, longer contact periods are desirable. Chlorine and carbon have an affinity for each other, and if both are added together the oxidation potential of the chlorine will be destroyed; in most cases better results are obtained by adding the carbon after the chlorine, but in some cases before the chlorine.

Adding carbon at the mixing basin has several advantages: it can act as a nucleus upon which floc particles may form, sludge is stabil-

ized, and caking of sludge can be prevented. There are two primary objections to applying carbon to the tops of filters—the filter runs may be shortened, and the carbon may pass through the filters; although if the latter happens it is probable that other impurities also are passing through. Dusting from carbon can be practically eliminated by receiving it in bulk and using wet storage. Where this is not possible, "Moisturized" carbon can be obtained, to which water has been added amounting to 20% by weight of the carbon.

A. Hyndshaw—"Factors Influencing the Efficiency of Activated Carbon;" *Journal, American Water Works Ass'n*, April.

Economics of Water Softening

Approximately 15,000,000 people in the United States now receive softened water. At present prices, large softening plants, in the 80 mgd range, can be built for approximately \$55,000 per mgd of capacity; plants in the 12-15 mgd range for \$90,000 per mgd, and a 2 mgd plant for about \$250,000. The annual cost by the lime-soda process for remov-

PUBLIC WORKS for June, 1951

ing 200 ppm of hardness from average water would be approximately 6.2¢ per 1,000 gal. for a 6 mgd plant, decreasing to 4.1¢ for an 80 mgd plant, including fixed charges, chemicals and labor. It is calculated that 50% of the customers who use 3,000 gal. per month or less at a minimum monthly charge of approximately \$1.50 would pay an additional 25¢ for softening. The cost of softening is outweighed by the savings resulting. Softening can be accomplished more economically and satisfactorily in the public water works than by individual softeners.

Louis R. Howson—"Economics of Water Softening;" *Journal, American Water Works Ass'n*, April.

Residual Chlorine Recording

A residual chlorine recorder has been used at the Wyandotte, Mich., filter plant. This instrument takes a small, continuous sample of the water and, by measuring a function of the chlorine residual in the water, records either the total or the free available residual value directly in ppm on a 24-hr. chart. It can be used to operate signal lights or an

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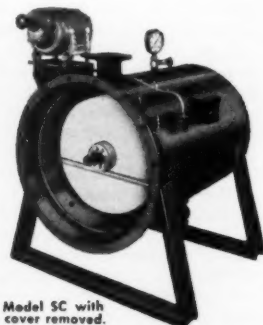
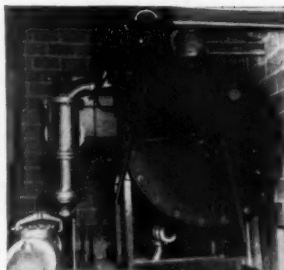
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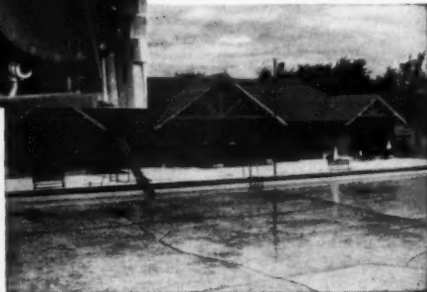
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368,000 gal. pool at Red Wing, Minn., equipped with Model SC filter operating on a one week cleaning cycle. Entire installation is in 13' x 17' area.



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alarm to indicate passing any given maximum or minimum residual. The water supply, drawn from the Detroit river, varies rapidly and unpredictably in pollution, the chlorine demand varying from 2 to 15 ppm so rapidly and frequently that chlorine dosages were changed 15 times daily, with a peak of 36 times. Before use of the recorder, checks of the chlorine demand were made hourly, and at 15 minute intervals after 3 P. M. Even with this frequent checking, the chlorine dosage could not be changed as promptly as desirable. Now, the recorder operates an alarm whenever the residual drops below 1 ppm, the dosage is adjusted, and in 3 minutes the result is shown on the chart. It now is possible to eliminate chlorophenolic tastes and odors; record the free chlorine residual, in ppm, in daily, permanent form; and record sudden changes in raw water demand for future checks. Such changes are called to the attention of the operators instantly. Chemical costs are reduced by avoidance of overtreatment, while free chlorine residual is maintained at all times without resort to jar tests and analyses.

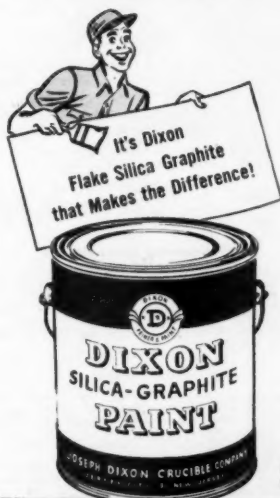
George J. Hazey—"Amperometric Residual Chlorine Recording;" *Journal, American Water Works Ass'n*, April.

Metering In Kenosha, Wis.

The Kenosha water department last year measured by consumer's meters 89% of the water delivered to the distribution system. In 1931 only 69.3% of the water pumped was accounted for. Beginning in 1932, the department purchased the 8,054 meters owned by the consumers, installed more than 2,000 new ones, and removed and tested an average of 1100 meters annually for five years. A pitometer survey in 1938 found only 136,000 gpd of main leakage, which was repaired; but disclosed 209,000 gpd under-registration of large meters, which was corrected as quickly as possible. Meantime, testing and repairing of all meters was conducted systematically; during 1948-1949 about 45% of the 12,173 meters in service were tested. Data from their records show that 35% to 40% of the residential consumption is at rates of 2 gpm or less. Reconditioned small meters register an average of 100.2% in the 2-12 gpm range; 98.9% in the 0.25 to 2 gpm range; and all would operate at 0.125 gpm. New meters purchased recently averaged 95.79% ac-



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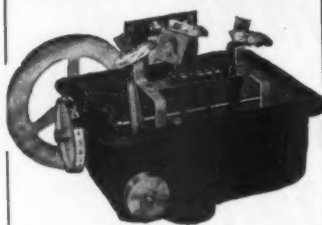
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curacy at 0.125 gpm. Maintaining low percentage of unaccounted for water requires 100% metering (including private fire lines); purchasing meters on a strictly quality basis; an intensive meter maintenance program; and daily checking for leaks.

Harold T. Rudgal—"Good Metering Practices Prove Their Worth at Kenosha, Wis.," *Water Works Engineering*, April.

BIBLIOGRAPHY

American City

Good Groundwater Made Better. By D. E. Chase, Mgr., and H. H. Markus, Solicitor, West View, Pa. May, Pp. 82-83.

American Water Works Ass'n Journal

Economics of Water Softening. By Louis R. Houston, Cons. Engr. April, Pp. 253-259.
St. Louis Dry Line Chlorinating System. By A. F. Graf, Chf. Chem. Engr., and E. E. Easterday, Engr. of Design & Constr., Water Dept. Apr., Pp. 260-262.
Capacity and Loadings of Suspended Solids Contact Units. Committee Report. April, Pp. 263-291.
Amperometric Residual Chlorine Recording. By George J. Husey, Chf. Operator, Water Filtration, Wyandotte, Mich. April, Pp. 292-298.
Tentative Regulations Governing Water Service. California Section Report. April, Pp. 299-312.
Financing Water Works Improvements. By W. L. Gilmer, Cons. Engr. April, Pp. 313-321.
Factors Influencing the Efficiency of Activated Carbon. By D. Colebaugh, J. Filicky and A. Hyndshaw, W. Va. Pulp & Paper Co. April, Pp. 322-326.

Engineering News-Record

Building Waterworks in Puerto Rico. By Arthur J. Fox, Jr., Asst. Editor. April 26, Pp. 32-35.
What if an A-Bomb Hits Chicago's Water Supply. April 26, Pp. 36-37.
Dallas is Winning Its Battle for Water. May 3, Pp. 35-37.

Public Works

Supplying Industrial Water to Tacoma. By A. R. Macfarren, Mgr. Pp. 31, 79.
Helpful Suggestions for Operating Water Works. May, Pp. 38, 74.
High-Speed Laying of 78-Inch Pipe. May, P. 39.
Welding-Cutting Equipment Pays for Itself on One Job. By L. E. Baxter, Cons. Engr. May, Pp. 49-50.

Heat Treatment for Conditioning Sewage Sludge

This is a condensation of a paper by C. Lumb before the Northeastern Branch of the Institute of Sewage Purification. The entire paper is reported in the British Municipal Engineering.

It has always been recognized that mechanical dewatering of sewage sludge has many advantages over drying on open beds. These advantages include freedom from weather or seasonal interference, ability to maintain a regular schedule of sludge drawing and small land area requirements.

Due to the colloidal structure of the sludge it is exceedingly difficult to dewater untreated sludge mechanically, as by vacuum filters. An almost impenetrable layer builds

PUBLIC WORKS for June, 1951

The Microtrainer in Water Filtration. By John R. Baylis, Engr. of Water Purif., Chicago. P. 69.

Technique de l'Eau (Belgium)

L'Utilization du "Vacuum Concrete" Pour la Construction de Reservoirs d'Eau. By M. A. Achten. April, Pp. 7-18, 22.
La Mesure de l'Eau Froide et de l'Eau Chaude. By M. Edgar Schroeder, April, Pp. 23-29.

Water and Sewage Works

Miami's Hialeah Treatment Plant—1951. By Clarence R. Henry, Chf. Chemist, Dept. of Water & Sew. April, Pp. 143-148.
Coefficient of Friction and Fire Flow. By D. R. Taylor, Gen Mgr., Baton Rouge, La., W. V. April, Pp. 149-155.
Repainting Steel Water Tanks. By J. O. Jackson, V. P. Pittsburgh-Des Moines Steel Co. April, Pp. 160-163.
Water Hammer Correctives. By Richard Bennett, Hydraulic Engr., Phoenix, Ariz. April, Pp. 164-171.
Maintenance of Electrical Equipment in Water and Sewage Works. By A. R. Walker, Westinghouse Electric Corp. April, Pp. 172-175.
Propeller Type Meters for Main Line Metering. By James M. Montgomery, Cons. Engr. April, Pp. 176-178.
Radio Control-Karuss Record System Combination. By W. L. Wardrop, Engr. of Water & Sew. Wks., Winnipeg, Canada. May, Pp. 195-202.
Developments in Fluoridation. A Summary. By Harry A. Faber, Research Chemist, Chlorine Inst. May, Pp. 203-211.
Basic Factors in Centrifugal Pump Application. By Roy Carter, and I. J. Karusik, Worthington Pump & Mach. Corp. May, Pp. 212-218.

Water Works Engineering

Problems of Water Supply and Treatment at Miami, Florida. By H. A. Glasz, Director, C. F. Wertz, Res. Engr., A. P. Black, Chem. Consult., and C. R. Henry, Chf. Chem. April, Pp. 324-327.
Defense Program Has Had Minor Effects on Water Works. April, Pp. 328-330.
When to Replace Equipment. By W. Victor Weir, Pres., St. Louis County Water Co. April, Pp. 331-332, 400.
Good Metering Practices Prove Their Worth at Kenosha, Wis. By Harold T. Rudgal, Supt. April, Pp. 333-335, 421.
How Far Has Fluoridation Developed in U. S.? April, Pp. 336-338.
Maintenance of Raw Water Quality Standards. By Albert E. Berry, Dir., San. Eng. Div., Ontario Dept. of Health. April, Pp. 339-340, 393.
New Type of "Dry" Filtration Being Tried in Holland. By H. A. D. Linn, Engr., Netherlands Govt. Institute for Water Supply. April, Pp. 341-342, 388.
Safety in Water Works. By Wendell R. La Due, Chf. Engr. of Water & Sew., Akron, O. April, Pp. 343-344, 377.
New York Has Temporary Pumping Plant Ready for Emergency Use. By Torris Eide, Dept. Engr., Bd. of Water Supply. April, Pp. 345-347, 406.
Inserting Valves Under Pressure. April, Pp. 348-349.
A Water Department's Defense Against Atomic Warfare. By M. B. Cunningham, Supt. Water Dept., Oklahoma City. April, Pp. 379-380, 416.

up on the filter cloth quite quickly. To overcome this, some form of "conditioning" is necessary. Such conditioning has usually been accomplished by chemicals, such as ferric chloride, ferric sulphate, aluminum sulphate and lime; but another method whereby conditioning can be accomplished very satisfactorily, as well as economically, is through the action of heat.

When sludge is heated for a short period of time to a temperature somewhat in excess of boiling, an

irreversible conditioning effect is brought about which is much more powerful than is attainable by chemical coagulation. The temperatures necessary to accomplish this, while varying somewhat with the character of the sludge, ranges from 290°F to 370°F.

Heat treatment of this order not only coagulates the raw sludge and completely breaks down the gel structure, but it also reduces the water affinity of the solids. The bulk of the water, after heat treatment, can be separated by simple settlement and decantation, and the thickened residue is easily dewatered. Table I gives data on the relative speed of filtration for sludges conditioned in different ways.

TABLE I—Relative Speeds of Filtration

Conditioning Agent	Primary Sludge	Humus and Activated
None	30	1
Sulphuric Acid	100	2
Aluminum Sulphate (optimum)	200	10
Ferric Sulphate (optimum)	300	15
Ferric Chloride (optimum)	400	20
Lime (maximum effect)	1,000	80
Heat (30 mins. at 360°F)	8,000	1,000

This method has been used at the Halifax (England) plant since 1939. Heat treatment was first tried out on a working scale at Huddersfield and Norwich about 1911 to 1914, but the form of plant used precluded success. About 1935, the process was revived by W. K. Porteous, who eliminated the early defects. The Halifax plant was constructed in 1938-39; the installation was designed to handle humus and activated sludge, the production of which is from 120 to 150 ppm, based on the sewage flow, or about 30 pounds of dry solids per person per year. During the ten years from April 1, 1940, to March 31, 1950, an average of 22,960 tons of wet sludge have been dewatered per year. The average number of days that the dewatering plant has operated, counting Saturdays as half-days, has been 231.

Data on Plant Operation

Raw sludge is pumped from a storage tank through a heat exchanger into one of four welded steel pressure cooking vessels. In the heat exchanger, the sludge is preheated, largely by heat recovery from sludge already heated. High pressure steam is used for final heating; the sludge is held 45 minutes and the temperature is raised to 360°F, involving a pressure of about 150 psi. After heating (much of the heat is given up in passage through the heat exchangers to incoming sludge), the sludge

is allowed to settle overnight. About 60% of the original volume can then be drawn off as supernatant. This is returned to the main sewage flow, balanced over 20 or more hours. The thickened residue is then filtered in presses. For the 10-year period, raw sludge averaged 95.1% moisture; thickened sludge after heat treatment and decantation averaged 89.9% moisture; and the filter cake after pressing averaged 48.0% moisture.

Heat recovery has varied from 73.4% to 82.2%. Through preheating, the temperature of the incom-

ing sludge can be brought to around 300°F. Steam consumption per gallon of sludge treated has ranged from 0.84 pound in 1949-50, to 0.70 pound in the preceding year, and to 0.90 pound in 1946-47.

Press cloths are made of 16-ounce jute and 10-ounce cotton. Nylon is now being tried. Jute allows easier filtration and a cake of 2% or 3% less moisture content; but cotton delivers a clearer filtrate and less cleaning of the plates is required. Analyses of pressed cakes indicate an average content of organic and volatile matter of 51.2%;

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nitrogen as N, 2.26%; phosphoric acid as P_2O_5 , 5.14%; and potash as K_2O , 0.27%. The heat treatment liquor from this plant contains about 7,500 ppm total solids and 4,500 ppm 5-day BOD. This compares with the supernatant liquor from an experimental digestion plant at Halifax of 8,610 ppm total solids and 1,480 BOD.

The decanted liquor and the press filtrate is returned to the tank influent. In volume, these have averaged over the ten years, 0.22% of the average flow of sewage and 0.29% of the dry weather flow. They have contributed to the tank effluent an average of about 10 ppm 5-day BOD and 6 ppm four-hour oxygen absorption. The effect on the final effluent is much less. In another plant using heat treatment, a considerable number of analyses were made during periods when the heat treatment plant was in operation and when it was not. These analyses indicate that the BOD of the final effluent was increased less than 2 ppm when the heat treatment liquor was added. It should be remembered that heat treatment liquor is sterile and that the daily volume of production is or can be quite uniform.

The gross cost per ton of wet sludge dewatered was 34 pence in 1949-50; and 32 pence in 1948-49. Sale of sludge cake reduced the overall cost to 27.6 pence per ton of wet sludge in 1949-50 and 25.4 pence in the preceding year. In comparison, at Chesterfield (England), where there are heated sludge digesters and drying beds, the net working cost of sludge disposal for 1949-50 was 25.4 pence per wet ton or 51 shillings 10 pence per dry ton. The Chesterfield plant handles around 32,000 wet tons of 95% to 96% sludge annually.

The capital cost of the Halifax heat treatment plant, some of which was at post-war price levels, amounted to £28,685.

No "troubles or embarrassments" have resulted from odors, apart from odd instances in the early days of operation. These complaints were apparently caused by gas vented from the pressure vessels. Piping was changed to discharge this under the boiler fires, and this eliminated all complaint.

ED. NOTE:—Results of analyses are given as parts per 100,000 in the original paper. To conform to American practice, these have been changed to parts per million.

Electrically Operated Valves Control Water Distribution

LTJG William W. Gentry, CEC, USN

Assistant PWO, Naval Ammunition Depot, Crane, Ind.

FINDING the proverbial needle in a haystack was a cinch compared to the job of running down a break in the water main at the Naval Ammunition Depot, Crane, Ind. Prior to the installation of an electrically controlled valve system, large water losses caused by breaks or carelessness had gone uncontrolled for as long as 18 hours.

The difficulty was largely one of communication. The semi-loop-type water-main system is designed so that it can be divided into seven isolated zones. Any unusual drawdown on the five 100,000-gallon elevated steel tanks would show up on electrical recording devices at the water-treatment plant. It then took a process of elimination to locate the zone. One section would be isolated from the main supply by manual closing of control valves. A continuance or discontinuance of abnormal drawdown indicated

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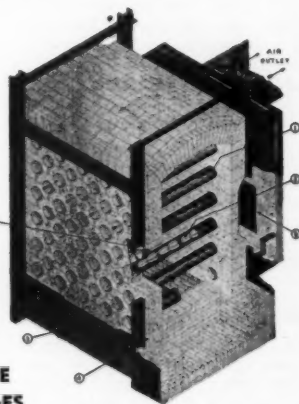


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3. Special recesses for caulking the tube ends and wall block joints assure minimum leakage and maximum efficiency.
4. Special "keyed" and wall blocks reduce leakage and aid in keeping the terminal walls in alignment.
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6. Manholes permit convenient replacement of individual tubes without disturbing the balance of the recuperator structure.

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FITCH RECUPERATOR COMPANY
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whether or not the break was located in the isolated zone.

It will be seen at once that this system required a large force of men in the field to operate the widely scattered control valves. Lack of adequate communication between the field crews and the control panel at the central plant made it difficult to correlate the isolating of the zones with observation of the recording devices.

The time element was of even more concern than the number of men involved. It would be disastrous if a heavy fire demand were imposed on the water system before the break had been located and repaired. In addition, a prolonged water draw-down would severely hamper the industrial facilities. Obviously a more efficient control system was needed.

After much consulting and planning, a Westinghouse Unicode Supervisory Control System was installed. Twenty electrically controlled valves can now be operated from a master control panel at the water plant. The new system cost \$36,000, which included all controls and 18 miles of control circuit. Locating a break is still a process of

elimination. But the process has been speeded up at least eightfold by centralizing valve control in the water plant.

Here is a typical example of present operation. The water-plant operator notices that the pumps suddenly speed up and begin to whine rather than hum. He checks and finds there is no unusual demand such as might be caused by a fire or hydrant-flushing. He notifies proper authorities and calls necessary assistance. In the control room he starts following the procedure for locating the affected zone.

If comparative losses of water in the elevated tanks indicate a suspicious zone, this section is isolated by closing, in order, the proper valves. Close observation of the altitude gage and attention to the speed of the pumps will enable the operator to determine within 10 or 15 minutes whether the break is in the isolated section.

If a break is indicated but the zone is not suspected, the operator divides the distribution system into two approximately equal parts, isolating one half and continuing pumping in the other. If the pressure rises normally in the pumping

side and the rapid loss of water ceases, it is assumed that the isolated side is the affected area. On the other hand, a continued pressure drop would point a guilty finger at the pumping side. This process is then repeated until, by elimination, the affected zone is located.

Crews are then dispatched by telephone or radio-equipped security vehicles to the areas of the zone in which a break is most likely to happen. When the break is located, it is isolated to as small a section as possible and service to the zone is resumed.

Although similar systems have been used for years in oil-refining plants, it is not known whether a comparable system of electric control of water distribution is in use. Such a system might well be considered by other large installations as well as by municipalities. In case of a major disaster, where it is imperative that pressure be kept on the mains for fire fighting and continued operation of industrial facilities, the system would prove invaluable.

This article is adapted from the Civil Engineer Corps Bulletin, of the Navy Department.

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PUBLIC
WORKS

DIGESTS

THE HIGHWAY AND AIRPORT DIGEST

Colorado
Road Standards

A committee appointed by the Governor of Colorado in 1949 to study the conditions and needs of the State's highways, has reported that, of the 79,695 miles of the highway system, 27,075 need reconstruction or complete new construction, and 13,161 miles need major repairs. The road surfaces were divided into 5 classes—high, high medium, medium, low medium, and low. The high surfaces will be concrete or asphaltic concrete, used on state highways carrying 1600 to 15,000 vehicles daily and for the principal city streets. High medium surfaces will be plant mix mats 2" or thicker, used for rural state highways carrying 800 to 2,000 vehicles daily, and for county primary roads carrying over 1,000 vehicles daily. Medium surfaces will be plant mix or road mix 2" or thicker, used for rural state highways or county primary roads carrying 400 to 1,000 vehicles daily and for local service city streets. Low medium surfaces will be surface treatments and road mix mats less than 2", for rural state highways and county primary roads carrying 100 to 600 vehicles daily. Low surfaces will be gravel, sand-clay or rock, used for rural state highways used by less than 200 vehicles daily, for county primary and land service roads used by less than 100 vehicles, and city streets of minor importance.

J. M. Armstrong — "Colorado Standardizes Road Surfaces;" **PUBLIC WORKS**, May.

Colored
Road Surfaces

Interest in and use of colored asphalt surfaces for roads in England is discussed in an article by the county surveyor of Durham County, where several miles have been laid, using as aggregate "a richly colored red whinstone." In other localities pink and grey granite have been

used for the middle lane of a three-lane road. During the first few months of life the surface presents the normal dark color, but wears to expose the color of the aggregate. Advantages claimed are: In some circumstances the color helps in reducing accident risk; black objects on the road are silhouetted more clearly by both day and night; it tends to cut down headlight glare from wet surfaces; it offers a pleasing contrast to the green of adjacent land; the red chippings used possess better non-skid qualities than the customary aggregate.

E. P. Brookes—"Coloured Road Surfaces;" *Roads and Road Construction*, April.

Fully Automatic
Asphalt Plants

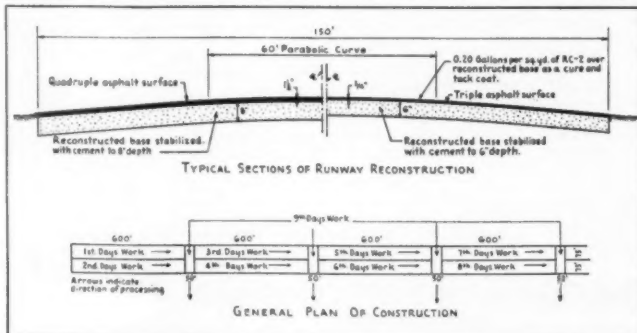
Hot-mix asphalt plants equipped with fully automatic push-button panel board control—said to be the first use of such equipment in the East—will be used on four of the seven contracts for constructing the New Jersey turnpike this year. For Sections 3 and 4, Tioga Construction Co. is erecting a plant consisting of 4 Madsen units equipped with Robbins controls, to produce 375,000 tons of hot-mix during the season. For Section 7 the mix will be produced by two Cummer plants

fitted with automatic controls. For Section 2, two Simplicity plants with automatic controls will supply hot-mix at the rate of 225 tons per hour. The total amount to be laid this year is 3,780,000 sq. yd. of asphaltic concrete $4\frac{1}{2}$ " thick, laid in two courses; on 8" macadam base in three courses, on 6" of sub-base in two courses.

Harold J. McKeever—"Planning the Big Turnpike Paving Job;" *Roads and Streets*, April.

Soil-Cement
Base for Runway

Lubbock, Texas, in 1940 started an air base, constructing the runway pavement with an 8" compacted flexible base material from a local pit, surfaced with a triple asphalt penetration surface. This deteriorated into a critical condition and rehabilitation was begun in August 1950. Although the base material had failed completely, instead of removing it (after the asphalt surface had been removed) it was graded and then compacted with a pneumatic roller, preparatory to cement stabilization. Bulk cement was distributed with a belt-type Smith spreader attached to a dump truck. An hour later the base was pulverized 6" or 8" deep, mixed and moisture added by means of a single-



Courtesy: *Roads & Streets*

● CROSS-SECTION of a soil-cement runway at Lubbock.

pass stabilizer. This was followed by a sheepfoot roller, worked back and forth until the lower 2/3 had been thoroughly compacted, and another sheepfoot then compacted the top 1/3. The surface was then given a relatively heavy shot of water, then scratched about 1" deep with a spike-tooth harrow, followed by a blade for smoothing and shaping. Then a light harrowing was followed by a pneumatic roller, and this by blading to a depth of 1/4" to 3/8" and rolling with a flat-wheel roller. The surface was then given a light shot of water, followed by 0.2 gal. per sq. yd. of RC-2 for curing. Inspectors checked the preliminary grading, optimum moisture of the material to be processed and the moisture content after stabilization, depth of stabilizing, the sheepfoot rolling, compaction planes and finishing, and the ultimate density.

R. L. Oldham—"Soil - Cement Base Rehabilitation at Lubbock Municipal Airport," *Roads and Streets*, April.

Herbicides for Roadside Maintenance

Chemical herbicides may be divided into three general groups—soil sterilants, contact herbicides, and selective herbicides. Sterilants include common salt, boron, sodium chlorate, ammonium sulfamate and TCA. Contact herbicides include oil, 2,4-D and 2,4,5-T, the dinitro compounds; sodium chlorate, ammonium sulfamate. Selective herbicides include 2,4-D and 2,4,5-T. The tops of grass can be killed back, without destroying the roots that help prevent soil erosion, by one of the dinitro compounds. Perennial grasses such as quackgrass or Johnson grass can be controlled by use of TCA, but not where erosion would result from loss of grass cover. Few herbicides, including soil sterilants, will give 100% control with only one application.

Dudley B. Chittenden—"Chemical Herbicides—Handy Tool for Maintenance Men," *Better Roads*, April.

Surface Treating With Precoated Screenings

Queens Borough, New York, in 1949-50 surface-treated 1,500,000 sq. yd. of old pavements, using quick-setting emulsion and 3/8" stone chips. Because of complaints of dusty stone cover and excessive stone in gutters, change was made to precoated aggregate, and 350,000 sq. yd. have been laid, using run-of-crusher

screenings, 100% passing 3/8", heated to 325° and mixed with 4 1/2% (later changed to 5%) of 85-100 pen. asphalt cement, which can be spread hot (300°) at 40 to 50 lb. per sq. yd. using a box spreader of the type commonly used for sand and stone chips. The screenings are rolled immediately after laying, using a 7-10-ton tandem roller with a wet wheel. This gives a smooth, uniformly textured surface about 1/2" thick, well bonded to the base with a high-viscosity asphalt emulsion which seals surface cracks in the old pavement. They propose to cover, this year,

about 3500 sq. yd. per day per gang, at a cost of about 12¢ per sq. yd.

Joseph J. McGowan—"Seal Coating with Emulsion and Hot Precoated Screenings," *Roads and Streets*, April.

Maintenance By Contract

An official of the A.G.C.A. gives the ideas of contractors on the maintenance of roads and streets by contract. They believe that, by contracting maintenance, the cost, quality of work and completion on schedule are guaranteed by the

STANDARD STEEL "S-J" for PATCHING SPEED



PERFORMS EVERY MAINTENANCE FUNCTION... SPRAY SHOULDERS • RELOCATE CURVES • PATCH CHUCK HOLES • SEAL COAT and SECONDARY CONSTRUCTION WORK

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Mayor Ray E. Otten, Versailles, Mo., says: "We're doing some fine work with this machine . . ." It's a money-saver on any type job that can be handled with this fast working equipment.

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contractor's bond. Free and open competition among contractors with experience, equipment and stable financial condition secures low costs. The careful planning by the engineers necessary for bidding secures better results and avoids costly mistakes due to day-to-day planning by department workmen, and centralizes responsibility. But contractors should be assured that there will be work of this kind for several seasons; that he will be free to use methods and equipment that he finds economical; that he can begin on the job at once; that the plans and specifications be fair and clear. Cooperation between contractors and the highway department may result in preparing specifications to permit awarding work that might not appear to lend itself to the contract method. It is well to award contracts of various sizes; standardize as far as possible; make the construction season as long as possible; seek a balanced program, and pay the contractor promptly.

A. N. Carter—"Maintenance by Contract Will Lower Cost;" *Better Roads*, April.

BIBLIOGRAPHY

Better Roads

- Making Bridge Funds Go Farther. By Carl F. Lind, Co. Engr., Sutter Co., Fla. April, Pp. 25-26, 40.
Chemical Herbicides—Handy Tool for Maintenance Men. By Dudley B. Chittenden, Engr., Iowa State H'way Comm. April, Pp. 27-28, 40.
Economical to Make Own Signs? Forum reports from county highway officials. April, Pp. 29-31, 38.
Low-Cost Bituminous Surfaces Serve Increasing Traffic. By E. S. Rankin, Co. Engr., Crow Wing Co., Minn. April, Pp. 33-35.
Road Maintenance Needs and Rearmament. By L. P. Hoover, Co. Supt., Columbia Co., N. Y. April, Pp. 37-38.
Maintenance by Contract Will Lower Cost. By A. N. Carter, Mgr., H'way Div., A.G.C.A. April, Pp. 42, 44.

Civil Engineering

- New York State Thruway to Be Paid for by Special License Fees. By Bertram D. Talamy, Chrm'n., N. Y. Thruway Authority. May, Pp. 44-46.

Contractors Record (England)

- Highway Engineering Geology. By D. C. Henry. April 25, Pp. 11-16, 32.
Coated Macadam—Some of Its Uses and Abuses. By A. J. Lyddon. May 3, Pp. 16-20.

Engineering News-Record

- Extra Lanes on Grades Provide Cheaper Mountain Highways. April 19, Pp. 47-48.

Public Works

- How a Big Engineering Firm Handles a Paying Program. By Henry Charles Suter. May, Pp. 34-35, 63.
Colorado Standardizes Road Surfaces. By J. M. Armstrong. May, Pp. 40-41.

Roads and Road Construction (England)

- Colored Road Surfaces. By B. E. P. Brookes, Asst. Co. Surveyor. April, Pp. 101.

Three Lanes Cost Less Than Two

In the 74 miles of U. S. 99 between Roseburg and Grants Pass in Oregon, the highway passes over three summits of about 2,000 ft. elevation. The traffic is not heavy enough to justify more than two lanes on a level road, but where the grade exceeds 4%, a third lane is added and continued over the summit and down the other side. This additional lane is calculated actually to reduce first cost operating and maintenance cost and reduce accidents. First cost is reduced because safe sight distance for three lanes need not be so great as for two, and thus excavation to give the necessary flatness of vertical curvature at the summit can be reduced. With the third lane, slow trucks can be passed and the rapid traffic be expedited. After heavy snow storms, the snow can be plowed to the sides of a 3-lane road so as to give a 2-lane free opening.

"Extra Lanes on Grades Provide Cheaper Mountain Highways;" *Engineering News-Record*, April 19.

Roads and Streets

- Planning the Big Turnpike Paving Job. By Harold J. McKeever, Editorial Dir. April, Pp. 37-41, 54.
Sole-Cement Base: Rehabilitation at Lobbhock Municipal Airport. By R. L. Oldham, Dir. of Pub. Works. April, Pp. 42-44, 58.
Equipment Suggestions for More Efficient Roadside Work. By Hilbur J. Garmhausen, Ohio Dept. of H'ways. April, Pp. 46-49, 51.
Salvaging Old Pavements by Bituminous Surfacing. By O. L. Kipp, Dep. Com'r, and C. K. Press, Asst. Engr., Minn. Dept. of H'ways. April, Pp. 69-72, 76.
Seal Coating with Emulsion and Hot Procoated Screenings. By Joseph J. McGowan, Engr. H'way Maint., Queens, New York City. April, Pp. 75-76.

Feeding Fluoride in Lewiston

Sodium fluoride is applied to the Lewiston, Ida., water by means of a Wallace & Tiernan dry chemical feeder, which is equipped with a special variable speed pulley to give it greater range. It will feed from 1 ounce to 100 ounces per hour; the normal rates of feeding vary from 20 to 90 ounces. A solution feed method is used for a well which provides a supplemental supply of about 850,000 gpd during part of the year. The well water contains about 0.8 ppm natural chloride, and this is brought up to the standard 1 ppm by injecting sodium fluoride solution into the pump discharge. The water contains a small amount of hydrogen sulfide and this is neutralized with chlorine. Hypochlorite and sodium fluoride are dissolved in the same solution and fed into the line at one time by the hypochlorinator.

Air Pressure to Install Service Lines

Tony Eikey

Sup't. of Public Works, Traverse City, Mich.

We have been using air to install service lines. This is especially effective in sandy soils, and saves considerable time. By using sections of pipe about 5 ft. long and connecting the air hose to one end, the pipe can be pushed forward slowly. The sand will be blown back or outside of the pipe. By adding other sections and continuing this operation, a pipe can be installed across a street 25 to 30 ft. wide in 15 to 30 minutes. Copper tube is then connected to the end of the pipe and pulled back. For larger lines, a one-quarter pipe is used inside of the pipe or copper tube to be installed and the sand is blown back through the pipe. Using this method, a 2-inch pipe has been pushed under a road 20 ft. wide in 5 minutes after the setup was completed.

HELICOPTER EFFECTIVE FOR SPRAYING ELM TREES

Ralph B. Meaney,

F. A. Bartlett Tree Expert Co.

IN Walpole, Mass., we have found many difficulties with ground spraying of trees. Among the faults are: Inability to get enough material into the tops of tall trees; uneven distribution of material from manual operation; the lack of speed to spray an entire town at the time it is most needed; the high labor costs; and the bird kill due to material dripping off as wastage. This is the procedure we use in our work to overcome these disadvantages:

In November, we gather infested wood in which we know there are lots of elm bark beetles; in April, we put pieces of this wood in containers and set one in each town in which we work. Regular checks are made for flight emergence. This may differ in every community, due to climate and humidity. This is the first step in getting the DDT applied at the right time. The next step, of course, is to be sure to cover the crowns of the elms with enough droplets per square inch of twig and leaf surface so that the beetle cannot fail to come into contact with the DDT. The helicopter permits the application of fine droplets which are more effective than the fewer large droplets.

In using the helicopter, the following practice is followed: First, we check all town street boundaries, sometimes using lime to mark the town line. Next we locate vacant

lots in one or more spots convenient to the working areas. Because we know the amount that is going to be applied, we can easily calculate the amount of spray material needed. Usually street trees in New England average an 80-ft. spread, and so for a mile of street trees, we have 7.9 acres on one side of the street. We do one side at a time, flying about 10 to 15 ft. above the tree tops, at about 20 miles an hour; however, we can and do hover over an unusually large tree, if necessary.

The helicopter carries 40 to 50 gallons of spray; usually we limit the load to 40 gallons. One minute is required for loading. Various types of nozzles are used, depending upon requirements. Costs compare favorably with ground application methods; often costs are less. Care has to be taken to keep spray out of bird baths, goldfish ponds, turkey ranges and vegetable gardens. The rotor blade pretty well controls the windage or drift, but it is possible for the pilot to spray one of these places before he realizes it unless warned in advance.

City Sponsors Sale of Garbage Disposers

Herrin, Ill., last fall announced that it was going into the business of selling garbage disposers to combat the increasingly bad garbage problem. An intensive "clean-up" week, during the middle of May, was given over to pushing the sale of G-E disposers to the residents. The installed price of the units is slightly less than a hundred dollars.

Progress Reports on Maryland Road Test Section

The research project known as Road Test One-MD is being carried out on a 1.1-mile section of 4-lane concrete pavement on US Route 301, south of La Plata, Md. The pavement consists of 12-ft. lanes, 9-7-9, reinforced with wire mesh. Expansion joints are at 120-ft. intervals, with contraction joints at 40-ft. spacings; dowel bars are $\frac{3}{4}$ -inch, 15 inches apart, in all transverse joints. Adjacent lanes are tied with 4-ft. bars at 4-ft. intervals. Two types of test trucks are used, one loaded to 18,000 pounds and 22,400 pounds on single axles; and the other type loaded to 32,000 and 44,800 pounds on tandem axles. There are four separate test sections, one for each of the test loadings.

Soil tests indicate a definite correlation between soil type and pavement behavior: The higher the granular content and the lower the plasticity of the soil, the better the pavement performance. Results of the load applications were:

The 44,800-lb. tandem axle loads caused about eleven times as much cracking, measured in lineal feet, as the 32,000-lb. tandem axle loads, based on 20,000 to 92,000 truck passes in each lane. The 22,400-lb. single axle loads caused approximately six times as much cracking as the 18,000-lb. single axle loads, based on 35,000 to 175,000 truck passes.

After 84,000 truck passes, 80% of the joints in the section carrying the 44,800-lb. tandem axle loads were depressed as compared to only 10% for the 32,000-lb. tandem axle. After 137,000 truck passes, 22% of the joints in the section carrying 22,400-lb. single axle loads were depressed, as compared to 2% of the joints in the section carrying the 18,000-lb. single axle loads. The same general relationship existed in the appearance of cracks in the pavement slabs.

These data were reported by the Highway Research Board. Studies are being continued.



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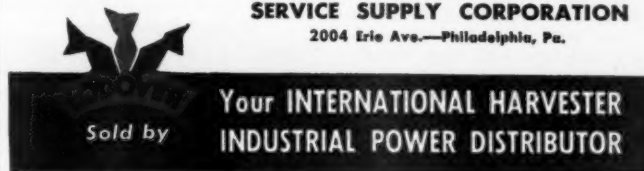
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METHODS OF HIGHWAY SERVICING AND MAINTENANCE

CONTINUED economy and increased preventive measures of road maintenance have been necessary in Wayne Count, Mich., but it has still been necessary to reduce some of the services offered to the public in the past. Vigorous action is being taken to prevent damage to the older concrete roads by overloading before they can be resurfaced and strengthened. Where damages occur to residential streets by hauling materials and equipment to building projects, the builders causing the damage are being held responsible for the cost of repairing the damaged roads.

A refinement has been introduced into skin patching or asphaltic sealing of old concrete roads. Emulsified asphalt is applied to the surface by a pressure distributor attached to a tank truck. Then stone chips are applied evenly by means of rotary spreaders and the surface is rolled. These chips, formerly applied untreated, were the cause of clouds of dust stirred up by passing traffic, and many complaints were received, especially in residential areas. To overcome this fault, the chips are now treated at the yard with a small amount of liquid asphalt. This eliminates the dust without making the chips too tacky to be handled.

This method of repair has another advantage in that it eliminates the need for a tack coat when and if an asphaltic concrete surfacing is applied. It has been found that the seal coat softens up under the application of the hot mix and acts in the same manner as a tack coat.

Pavements for Subdivisions

The record building boom of the past year has resulted in requests for many street openings in subdivisions which have been idle for years, most of them since they were placed on record during the 1920's. In most cases, any pavements originally laid have long since disintegrated. Nearly one hundred sections of residential streets were opened and improved during the year, totalling 16 miles in length. Most of this mileage is in former rural areas

which are now completely built up and require city-type maintenance, further adding to costs. A definite procedure has been established for such paving work by assessing adjacent property owners. Either cement-concrete or penetration-macadam roads are constructed, depending on the type of drainage available. In general, where drainage is adequate, a concrete pavement with curb and under-drainage is constructed. When surface drainage must depend on open ditches, a penetration-macadam pavement is more feasible and can be provided at about one-half the cost of the concrete pavement.

Payment for a concrete pavement may be made by the property owner in four installments, and for macadam in three installments. Financing is permitted by the sale of bonds; however, bond buyers have been willing to purchase bonds only up to 75% of the cost of the project, and these bonds must be retired out of the first monies collected on the tax roll. To finance the remaining 25% of the cost presents a problem. During the past year, this matter was cared for by advances made by the Township and the Wayne County Highway Boards, but the increasing volume of the work makes such advances impossible in the future. Amendments to legislation to permit Township Boards to pledge the credit of the Townships, making it possible to sell bonds to 100% of the cost of the project appears desirable.

On the projects completed last year, the assessment for such work amounted to 80% of the total cost and resulted in assessments of \$3 per lineal foot for penetration macadam pavements and \$8 per lineal foot for cement-concrete pavements.

Winter Maintenance

Sleet and ice present winter maintenance problems. When storms occur, salt is applied promptly over the entire highway by mechanical spreaders attached to the rear of trucks. Snow fence is used where-

ever possible. Since prevailing winds are from the west, only north-south roads can be protected by fence. Such fence has been particularly effective on roads with a low grade line.

Dust laying services on secondary roads are provided as necessary for safety and convenience of travel. However, applications for such services are no longer received directly from residents, but are handled through the Township offices. Mowing of roadsides is provided several times a year for primary roads and at least once a year for all roads. A clean roadside gives better visibility and helps prevent drifting of snow in winter. The Forestry Division has been experimenting with weed-killing chemicals, reducing the frequency with which mowing is necessary.

Weed Control and Mowing

The value of weed control through spraying with dichlorophenoxyacetic acid, commonly known as 2,4-D Formula 40, has been well demonstrated. Both Outer Drive and Lake Shore Drive lawn areas are practically free of weeds after using this chemical during the past four years. The amount of mowing has been reduced, especially in the late summer months when the growth of unsightly weeds was the principal reason for mowing.

Power mowers of the rotary and whirlwind types continued to be the most effective equipment on boulevard lawn areas landscaped with many trees and shrub groupings, but wherever practicable tractor-drawn fairway units and sidebar cutters were used. Strictly roadside mowing was done with tractors and sidebar mowers. By supplementing the mowing program with chemical weed control, one mowing each summer is all that is necessary on most roads to attain reasonably safe and attractive roadsides.

In the weed control operations, seven tractor-drawn sprayers and a jeep with a tank mounted on the rear and equipped with a hydraulically operated 21-ft. boom were used. The jeep was found to be the most versatile and useful. The total miles of roadside sprayed was 821. All sprayers were operated at a pressure of 40 to 50 psi and were drawn at a rate of 4 mph. A 39% solution of 2,4-D was applied in the spring and fall at the rate of 2 to 2½ quarts per acre. The rate was increased in the summer to 3 to 3½

quarts per acre because of the presence of larger weeds and their increased resistance. The entire program required the use of 3,100 gallons of 2,4-D concentrate, and this was applied to 4,675 acres of area. Excellent results were obtained, and the average cost per acre on all roadsides and parkways sprayed was \$4.05.

These data are from the 44th annual report of the Board of County Road Commissioners of Wayne County, Mich. Leroy C. Smith is County Highway Engineer; John E. Hiltz is engineer of Highway Maintenance and Milford N. Brown is General Superintendent.

Gas Storage at A Sewage Treatment Plant

At the Ann Arbor, Mich., sewage treatment plant, digester gas may be used for sludge heating, sludge drying, operating gas engines, heating buildings and water and for the laboratory. Approximately 70,000 cu. ft. of gas per day are produced, which has an annual value to \$11,500. Since gas production and gas utilization both vary, storage is necessary. This is provided by a

Hortonsphere with a capacity of 50,000 cu. ft. of gas at 30 psi. This is a metal tank in the form of a sphere, supported by four legs.

Small Town Solves Its Parking Problem

THE usual parking problem existed in Newbern, population 1,700, a rural trading center in Tennessee. Finding a parking space downtown on Saturday was a near impossibility. Accordingly the town merchants set out to find a solution. Fortunately there was a large vacant lot directly behind the main business district. It was estimated that \$5,000 would be necessary to convert this to a practical parking lot. Businessmen pledged an agreed-on amount to the parking lot fund on legal paper carrying note interest charge—actually a promissory note. The municipality borrowed the amount needed from the local bank at 4% interest, using these pledges as collateral; and collects the pledges on a weekly, monthly or lump sum basis; and pays off the principal of the loan from these collections. Thus, the only charge to the municipality is the interest.

Once the money had been pledged, assistance for the design of the lot was requested from the Tennessee State Planning Commission. The following criteria were decided on:

(1) That the area should be well lighted in order to discourage petty theft; (2) that the parking area should be surfaced with fairly heavy-duty paving in order to reduce maintenance charges; (3) that adequate provisions be made for drainage; and (4) that space be provided for about 100 cars and several long-bedded farm trucks to serve local farmers.

In the design, 60° parking and a one-way traffic pattern were utilized. The area next to the store buildings was reserved for truck unloading. A curb and gutter system was installed, tying into existing storm sewers for drainage. Parking space was provided for 100 cars and 6 trucks. A double-shot bituminous surfacing was placed. This project was so successful that another was constructed on the opposite side of the main street. Total cost was approximately \$30 per parking space. Actual cost to the community is \$360, representing interest charges.



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Mathews, Va. is a small town with widely scattered population except for three square blocks of the business section, and it was thought that this area only needed sewage collection and treatment, and the amount of sewage here would be equivalent to that of 100 population—say 10,000 gpd. Oystering is a chief industry and the oyster beds must be protected from pollution. The plant adopted, and built for \$18,387.62, consists of a reinforced concrete box 12.5 ft. square and 15 ft. deep, divided into digester, settling tanks, and contact aeration chambers. Hopper shaped bottoms eliminate the need for mechanical sludge collectors. A lean-to greenhouse outside covers two 4 x 13.75 sludge drying beds and the air blowers. Also outside the main building are a hypochlorinator and bar screen. There is 2½ hr. detention in the primary sedimentation chamber, 1½ hr. in each of the two aerators and 1½ hr. in the intermediate and in the final sedimentation chambers. Air is fed by two rotary-type blowers at the rate of 4 cu. ft. per gal. of sewage, through 24 diffuser tubes. The contact plates are standard cement-asbestos plates building boards ¼" thick spaced 1½" centers. Pumping is done by air lift, and is controlled automatically. Inspection of the plant each morning and evening insures good operation.

George H. Ellis—"Found: A Sewage Works the Village Can Afford;" *Engineering News-Record*, May 10.

**Double Filtration
of Birmingham's Sewage**

The dry-weather flow of sewage treated at the Minworth plant of Birmingham, England, is twice that of the River Tame into which the effluent is discharged, and provision is made for full treatment of all flows not exceeding 3 times the average dry-weather flow. The plant

is designed for alternating double filtration of flows up to 1.5 times the dwf, and single filtration, using all the beds, for amounts exceeding this. Birmingham sewage is very strong and contains large quantities of industrial wastes containing mineral acids, cyanides, chromium, copper, nickel and cadmium salts. That alternating double filtration is most suitable for these conditions is a conviction based on extensive experimental evidence and continuous operation for a period of 12 yr. Operating filters on recirculation does not maintain them in as good condition, although it requires less attention and is a little lower in capital cost. With single filtration at Minworth, the limit of the rate of treatment was fixed by the fibrous growth on the surface. With alternating double filtration, this growth develops on the primary bed but is arrested and disintegrated when this bed is changed over to secondary treatment. The discharge of humus sludge is uniform throughout the year and the total amount per year per mg of sewage is slightly greater than with single filtration. It is found that the primary should give an effluent with a BOD of less than 40 ppm so that it will starve rather than feed the fibrous growth on the secondary filter.

M. R. Vincent Daviss—"Alternating Double Filtration at Works of the Birmingham Tame and Rea District Drainage Board;" *Sewage and Industrial Wastes*, April.

**Vegetables Grown
On Polluted Soil**

Supplementing a previous article (see *Sewerage Digest* for May) the authors consider the dangers from cysts of *E. histolytica*, which, if ingested, might cause amoebic dysentery or chronic amoebiasis. They found that cysts are extremely sensitive to desiccation. Crops may become contaminated directly during irrigation with sewage or night soil or through contact with polluted

soil. Complete drying of cysts causes their death, and contaminated tomatoes and lettuce are free from viable cysts within 3 days after contamination occurs. Field-grown crops subject to contamination with cysts of *E. histolytica* can safely be consumed raw in the temperate zone one week after contamination has stopped, and after two weeks in wetter tropical regions.

Willem Rudolfs, Lloyd L. Falk and Robert A. Ragotzkie—"Contamination of Vegetables Grown in Polluted Soil;" *Sewage and Industrial Wastes*, April.

**Pumping Stations
At Oshkosh, Wis.**

Because of the flatness of the terrain, Oshkosh has found it necessary to pump its sewage at 8 different stations. Practically all the sanitary sewers are below lake level and the storm sewers are submerged for 1500 ft. from their outlets; hence the necessity for pumping the sanitary sewage up to the treatment plant and the storm sewage into the lake or the river which bisects the city. In some sections, rainwater from roofs is discharged into the sanitary sewers and so increases the amount of sanitary sewage that part of it is pumped into the lake.

The plants vary in size from 150 gpm to 13,200 gpm. Two 150 gpm stations and one 1200 gpm station are entirely underground. Condensation in one of these was eliminated by keeping a 150 w. light bulb burning continuously; otherwise the underground stations are unheated. The above-ground stations are kept at 55° or above by means of oil-burning hot water heaters, thermostat controlled. As more or less typical of all but the two smallest stations, one contains two 600 gpm pumps which pump to the disposal plant and a 2400 gpm which pumps directly to the lake, all electrically operated and float controlled. Under normal conditions one of the smaller pumps can handle the sewage flow. All the stations are automatically

controlled. One man checks them every day, changing charts, lubricating, keeping bar screens cleaned, checking float switches, etc. The stations are kept clean and painted. Wet walls are flushed out at intervals to control septic action. If both regular and standby units at a station should fail, portable equipment, consisting of two 6" and two 3" portable gasoline pumps are on hand to carry on the pumping temporarily.

R. W. Frazier—"Operating a Network of Eight Sewage Pump Stations;" *Wastes Engineering*, May.

Effect of Power Rammers on Backfill

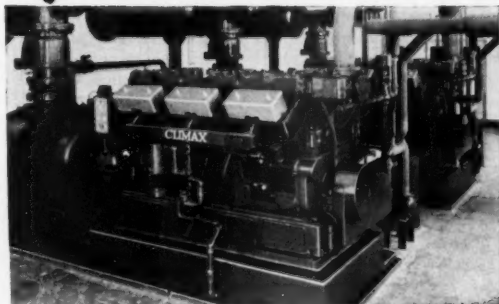
The English Road Research Laboratory studied the results from compacting trench backfill by means of four different makes of power rammers, each of which weighed about 200 lb. and operated by firing an explosive charge in the cylinder to cause the rammer to jump about a foot into the air. The backfill materials tested were gravel-sand-clay, sand, sandy clay, silty clay and heavy clay. The density was increased from 2.4% with sand to 8% with heavy clay, when tamped in 9" loose layers, the rammer base being moved after each blow so that each square inch received 3.7 blows. Less density was obtained if the layers were more than 9" thick. The amount of compactive force seemed to be greater than necessary, suggesting that the diameter of base might be greater than the 9½" standard; and 11¾" was suggested, but rammers with larger bases were more difficult to handle.

W. A. Lewis—"Performance of Power Rammers and Their Use in the Reinstatement of Trenches;" *The Surveyor*, March.

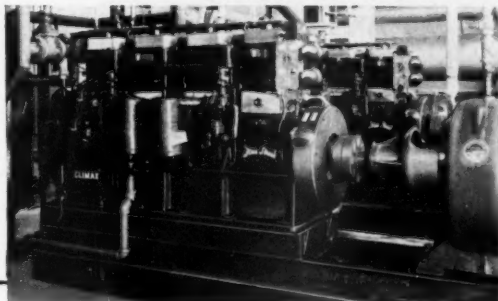
A Jig for Sheet Piling Trenches

In laying 2 miles of 9-ft. outfall sewer in wet ground, every foot had to be sheeted. The contractor was able to sheet up to 245 lin. ft. of trench daily by use of a sheeting jig. This was a 20' long welded, pipe-frame carriage on rubber tired wheels which rode on timber-braced steel channels or wales 60' long. Each side of the jig held a longitudinal pipe and steel channel rail, between which 20 to 25 lengths of 3" x 12" timber logging could be held at one time. Ten planks were set in the jig at a time by means of a clamping device fastened at their tops, which forced them firmly to-

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gether and permitted the crane to handle them as a unit.

"Sheeting Jig Insures Fast Sewer Job;" *Construction Methods and Equipment*, April.

Treating Penicillin Wastes

Waste waters from penicillin production are high in solids (average 12,400 ppm total solids) which have high nitrogen, carbohydrate, phosphate and vitamin contents and, when dried, are valuable as poultry feed. The BOD of the waste averages 4,030 ppm raw or 2,110 after

solids recovery; the oxygen consumed, 4,050 and 1,430 ppm respectively; the total solids 12,400 and 4,300, respectively; the total nitrogen 400 ppm and 95 respectively. Pilot plant studies indicated that wastes from penicillin respond readily to almost all methods of treatment. For biological treatment, addition of sanitary sewage is necessary to provide the proper microorganisms. For only partial treatment, short-period aeration is the most economical method per pound of BOD removed. For complete treatment, shallow trickling filtra-

PUBLIC WORKS for June, 1951

tion followed by deep trickling filtration is the most satisfactory method, although first cost may be lower with some other trickling filter combination. Superchlorination will remove a substantial part of the color.

David L. Muss — "The Treatment of Penicillin Wastes;" *Sewage and Industrial Wastes*, April.

BIBLIOGRAPHY

American City

- 40 Years of Progress in Sedalia, Mo., Sewage Treatment. By W. G. Riddle, Cons. Engr. May, Pp. 84-85.
Why Los Angeles County Adopted Cut-and-Cover Refuse Disposal. By C. E. Arnold, Co. Engr., Los Angeles Co. May, Pp. 92-93.
State-Sponsored Sewerage Program Will Reduce River Pollution (Rhode Island). By A. A. Bonvicini, Sec., Blackstone Valley Sew. Com'n. May, Pp. 108-109.
The Elements of Refuse Collection and Disposal. By William S. Foster, Editor. May, Pp. 123, 125, 127.

Civil Engineering

- Houston Sludge Disposal Plant Profits From Use of Existing Facilities. By J. G. Turney, Samuel A. Greeley and Paul E. Langdon, Cons. Engrs. May, Pp. 26-29.

Engineering News-Record

- Full-Scale Operating Tests Prove Sewage Plant Performs as Designed. By Rex Collins, Cons. Engr., and Clayton Burns, Sew. Disp. Supt., McAlester, Okla. April 19, Pp. 42-44.
Urban Runoff Data Studied in Urlana by U. of Illinois. By Milton G. Schmidt, Assoc. Prof. of C. E. April 26, P. 43.
Brewery Builds Waste Plant; Flow Is Larger Than City's. By Boyd E. Guymon, San. Engr. April 26, P. 50.
City and County Attack Pollution on Long Island's Southern Shore. May 3, Pp. 32-33.
A Sewage Works the Village Can Afford. By George H. Elles, Cons. Engr. May 10, Pp. 35-37.

Municipal Engineering (England)

- Dunoon Opens New £42,000 Disposal Plant. April 27, Pp. 216-218.

Public Works

- Prefabricated Tile Media for Biological Filters. By Hugh C. Leiber and Randolph L. Smith, Cons. Engrs. May, Pp. 36-37.
How Texas Controls Water Pollution. By D. F. Smallhorst, Sr. Engr., State Dept. of Health. May, Pp. 46-48, 54.

Sewage and Industrial Wastes

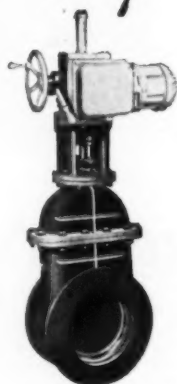
- Let's Look at the Record of Sanitation. By Gordon M. Fair, Prof. of San. Eng., Harvard Univ. April, Pp. 431-436.
Alternating Double Filtration at Works of Birmingham Tame & Rea District Drainage Board. By M. R. Vincent Davies, Deputy Engr. of Board. April, Pp. 437-450.
Design of Sewage Pumping Stations. By Richard R. Kennedy, Cons. Engr. April, Pp. 451-464.
Experience With Up-Sewer Chlorine Treatment in Southern California. By Richard Pomeroy, Cons. Engr. April, Pp. 465-477.
Contamination of Vegetables Grown in Polluted Soil. By Willem Rudolfs, Lloyd L. Falk and Robert Ragotzke, N. J. Agri. Exp. Sta. April, Pp. 478-485.
The Treatment of Penicillin Wastes. By David L. Muss, San Engr., Heyden Chem. Corp. April, Pp. 486-496.
Adsorbents in Waste Water Treatment: Dye Adsorption and Recovery Studies. By H. A. Thornton and J. R. Moore, Chem. Engrs., Attapulgus Clay Co. April, Pp. 497-504.



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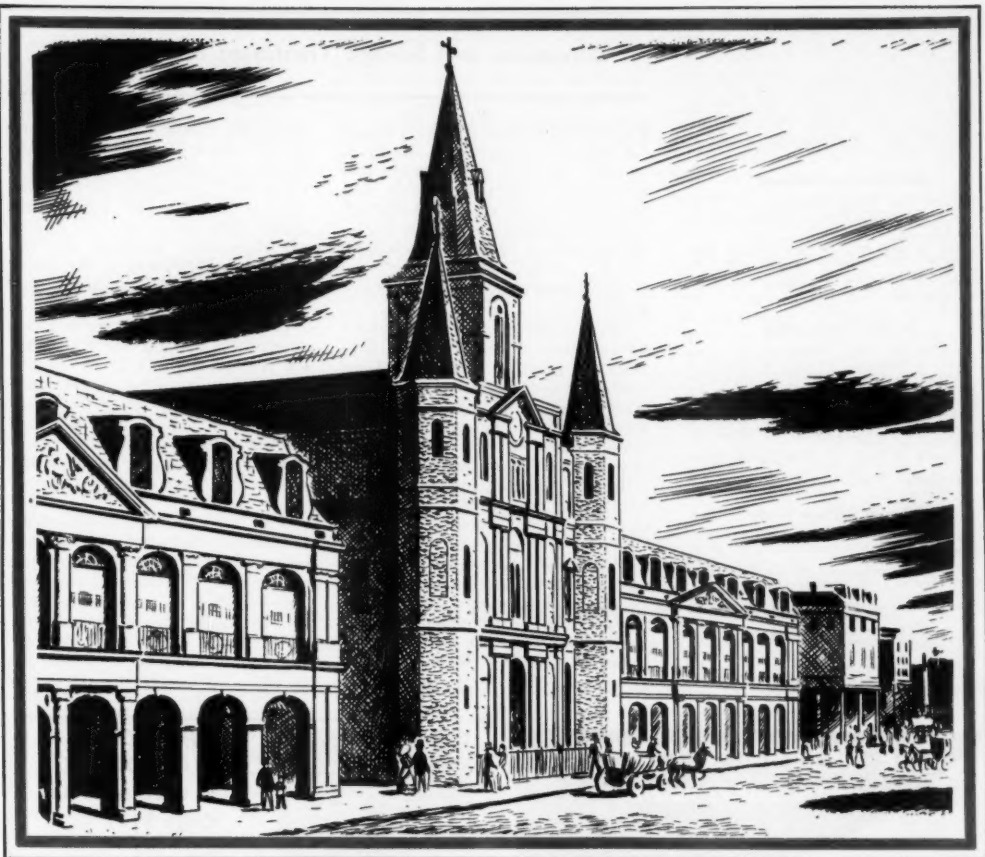
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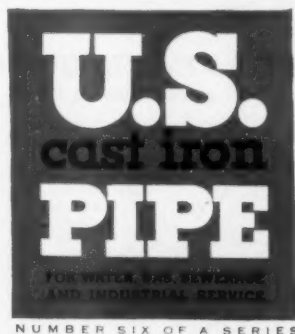
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B.O.D. Determination of Trade Waste Samples in Admixture with Sewage. By W. E. Abbott and R. J. Fearn, Chem. and Asst. Chem. Sew. Disp., Nottingham, England. April, Pp. 505-507.

Survey of Industrial Wastes in the Lake Huron-Lake Erie Section of the International Boundary Waters. By A. E. Berry, Dir., San Eng. Div., Ontario Dept. of Health, H. H. Black, Sr., San. Engr., U.S.P.H.S., and L. F. Oeming, Chf. Engr., Mich. Water Resources Com'n. April, Pp. 508-538.

The Surveyor (England)

Performance of Power Rammers and Their Use in Reinstatement of Trenches. By W. A. Lewis, Road Research Lab. March 30, Pp. 187-188.

Disposal of Sewage from Small Rural Communities. By Thomas G. Faulkner, April 13, Pp. 221-223.

Cleaning of Porous Air Diffusers. April 27, Pp. 253-255.

Wastes Engineering

Flocculation—Chemical Treatment at Little Miami (Cincinnati, O.) By A. B. Bachhermer, Prin. Engr., Sew. Disp., Cincinnati. May, Pp. 258-259, 284.

State Sanitary Engineers Describe Wastes Treatment Trends. By engineers of Rhode Island, No. Dakota, Tennessee, Wisconsin, Utah, W. Virginia, Vermont and Wyoming. May, Pp. 263-265.

Operating a Network of Eight Sewage Pump Stations. By R. W. Frazier, Supt. Oshkosh Sew. Com'n. May, Pp. 266-268.

Water & Sewage Works

Practical Aspects of Sewage and Waste Chlorination. By L. F. Warrick, U. S. P. H. S. April, Pp. 179-183.

Air Diffuser Maintenance. By Frank C. Roe, Carborundum Co. April, Pp. 184-189.

Sound Practices in Sewer Construction. By Fred S. Creswell, Mgr., Nat'l Clay Pipe Mfrs. April, Pp. 192-194.

Sewage Treatment Plant Equipment: Multiple Hearth Incinerators. By Frank L. Flood, Cons. Engr. May, Pp. 222-227.

A Formula for Designing Settling Tanks. By Carroll H. Coberly, Cons. Engr. May, Pp. 228-229.

Detergents and Sewage Treatment Plant Foaming

DETERGENTS are of three types: anionic (negatively charged), cationic (positively charged), and non-ionic (neutral). Anionic and cationic detergents are "foamers," but in combination they may hook-up to form an insoluble precipitate. "Surf," "Tide," and "Dreft" are familiar examples of anionic detergents.

Cationic detergents are ammonium-complex chemicals used to prevent the growth of bacteria. They are employed extensively in restaurants for washing dishes, and in taverns for cleaning glasses. On the other hand, non-ionic detergents, like the anionic, are used for general household and commercial cleaning, but they do not produce much suds especially in hot waters. "Joy" and "All" are of this type. To satisfy the housewife, however, bodying agents such as phosphates are frequently added to non-ionic detergents to increase the amount of suds.

Although soaps are anionic, their action is different from chemical detergents. They first react with

chemicals responsible for hardness in the water, and in hard-water areas the quantity of soap used is quite large. In order to overcome this problem many communities soften their water supplies. Chemical detergents, however, are unaffected by hardness in the water, which fact accounts for their greater usage in hard-water areas.

Chemical detergents are in a very competitive market, and the cheapest product is likely to be the best seller. Because anionic detergents are cheaper, they are more widely used, although considerable quantities of cationics are employed. Both of these varieties are "foamers" and are the likely cause of most sewage works troubles.

What are the effects of detergents on sewage treatment? As with any new product or discovery, detergents are suspect for every unaccountable variation in treatment of sewage. Primarily they are a nuisance, especially in plants employing the activated sludge process. During the agitation of sewage the detergents

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lower surface tension and bubbles are formed. The aggregation of small bubbles is the familiar "foam" observed in the aeration tanks. In the smaller plants foam builds up during the night when retention periods are long and agitation is extended. Some plants have had the entire battery of aerators concealed from view by foam eight to ten feet deep. In a moderate wind this blows around the plant grounds. It can be a hazard to the operator who has to work on slippery catwalks to service the units, and certainly it is aesthetically undesirable.

Detergents may inhibit the settling of solids in the primary tank, and help develop a greater amount of floating solids. The result is a heavier load on the secondary processes and fewer solids to the digester. Some operators have reported a decrease in gas production and have believed that detergents are toxic to the gas-producing bacteria in the digester. However, most detergents are not only non-toxic but may actually expedite digestion and the difficulty appears to be due to a reduction in the amount of solids settled and returned to the digester. However, a number of plants having detergent troubles report larger volumes of stronger supernatant.

It is likely that the detergents are destroyed by the treatment process or by nature after discharge from the plant. Wastes also may be pretreated with coagulants, as alum or ferric chloride, before reaching the plant; in case of industrial usage such pretreatment should be applied before discharge to the sewers.

At the plant, anti-foam agents, some promising types of which are being developed, may be added to the sewage. Unless foaming is serious, it is improbable that much expense would be justified, but if anti-foam agents could be produced and sold cheaply, there would be a ready market for them in sewage treatment.

This is a condensation of the discussion by R. E. Anderson, North Shore Sanitary District, and Harvey E. Berg and Dr. Carl E. Johnson of National Aluminate Corporation. The discussion was presented at a Section meeting at Elgin, Ill., and the condensation appeared in the Illinois "Digester".

Sludge Gas as Fuel for Motor Vehicles

Sewage sludge from Croyden and Norbury, England, is digested in six heated 100,000 cu. ft. tanks with floating roofs, insulated with 2" of cork. The plant includes a 25,000 cu. ft. gas holder. The gas is used

to heat the buildings and the digester tanks, to generate electricity for running all the machinery on the works and farms and for the lighting, and to provide fuel for operating vehicles. This last use is described in the English weekly *Municipal Engineering* as follows:

The plant comprises a "Belliss and Morcom" six-stage compressor, twelve high - pressure storage bottles, charging panels and piping, valves and accessories, washing plant and H₂S purifier. The compressor has a capacity of 100 cubic feet free gas per minute compressed to 5000 lbs. per square inch.

The storage cylinders, six of special alloy steel and six of high carbon steel, are 21-in. outside diameter by 14-ft. overall length, 2¼-in. thick and weigh about 3½ tons.

Vehicles are fitted with traction cylinders, which are 8-in. outside diameter by 6 ft. 6 in. long overall and weigh 150 lb. The water capacity is 1.76 cubic feet and they store about 400 cubic feet free gas compressed to 3000 lbs. per square inch. Further equipment comprises high and low pressure reducing valves, gas air mixing valve, pressure gauges and isolating valve. The operation of charging through the



when buying or specifying chlorine gas feeders

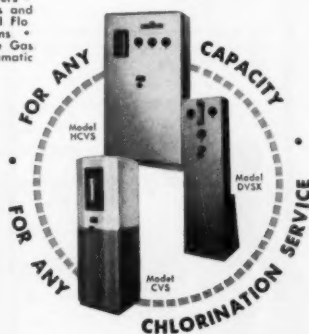
In other words, how will the chlorinator stand up under continuous use?

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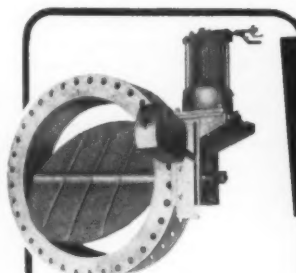
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Over sixty vehicles have been converted to run on gas and are effecting a saving of about 85,000 gallons of petrol per annum.

Wetting Agents for Wet Weather Road Surfacing

The British Road Research Laboratory has carried out extensive experiments to develop an effective way of ensuring that freshly laid surface dressings are not spoiled by rain. Fundamental studies of the physics of adhesion of the bituminous binders to stone surfaces in the presence of water were made, using various types of wetting agents mixed with the tar and tried out in surface dressings during summer and winter. All these produced poor results.

It was then decided to treat the other surfacing material—the stone chips. The chips are normally stored on the roadside in piles ready for the work later. The outside layer may be dry, but the inside of each heap is generally wet even in fine weather, so that the stone scattered on the tar is normally wet.

It was found that the water on wet stone is displaced if the stone is treated with creosote containing a "wetting" agent. This treatment enables the stone to stick to the tar immediately and water cannot later break this bond.

Of the materials tried, it was found that a solution of cresote and cetyl pyridinium bromide was completely successful. The best method of coating the stone is in a large mixer, for instance, at a quarry, but for stone already dumped at the roadside a concrete mixer is more convenient. The surface dressing will then stay on the road no matter how hard or how soon it rains after the dressing has been laid. It is also possible to spray the solution on the top of the tar film before

the stone chips are applied. This method gives good results although it is not quite so effective as using treated stone.—*Highways and Bridges via Highway Research Abstracts.*

Pollution Of U. S.—Canada Boundary Waters

A treaty signed in 1909 by Canada and the United States provided that neither nation should permit such pollution of the boundary waters as would injure health or property on the other side of the boundary. In 1946, the International Joint Commission appointed a board of technical advisers to determine whether this provision was being carried out. This board reported in October, 1950, that the discharge of untreated and partially treated municipal wastes has created a serious health menace and also adverse economic effects.

The regions covered by the report contain 61 municipalities with a population of 3,557,900, of which 96% is served by sewer systems and 86% has primary treatment, but only a small percentage has secondary treatment. There is a discharge of 750 mgd of municipal wastes and 2 billion gallons of industrial wastes with a BOD equivalent to that of more than 4,000,000 population; and also 13,000 lb. of phenols, 8,000 lb. of cyanides, 25,000 lb. of ammonium compounds and large quantities of oils and other materials. The waters connecting Lakes Huron and Erie carry a tonnage that exceeds that of any other waterway in the world, and the sewage from vessels at the height of the navigation season is equivalent to that from 1,000 population in the St. Marys River and 3,000 in the St. Clair-Detroit River area. In addition, disposal of garbage, bilge water and water ballast creates problems in ports. The Commission reported that pollution was discharged on each side of the boundary to an extent that is injurious to health and property, and urged that all municipalities treat their sewage by sedimentation and disinfection, followed by secondary treatment if necessary to maintain a coliform MPN value not greater than 2,400 per 100 ml. in the water following dilution. The cost of this is estimated to be \$76,500,000 in the United States and \$25,000,000 in Canada. Additional treatment of industrial wastes is recommended, estimated to cost \$22,650,000 in the United States and \$3,450,000 in Canada.

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Supposing you have a line carrying liquids or gases coming into your plant and you want to meter the flow accurately. Wouldn't you want to avoid an expensive installation, one that possibly involves a housing or vault for a meter that has to be installed outdoors? That's where the compactness of the Foster Flow Tube will come in handy. You can install it anywhere on the entering line—most of them can be indoors. You install it just as you would a short section of pipe—and as easily. Except to connect valves or regulators, upstream or downstream, you don't even need straight sections.

Coupled with this simplicity of installation is an accuracy comparable in all cases to that of the conventional primary devices; in many cases, a greater accuracy. Foster Flow Tubes are available in all commercial pipe sizes. Write for details and tell us about your processing and installation requirements.

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Use coupon on page 109; circle No. 6-1

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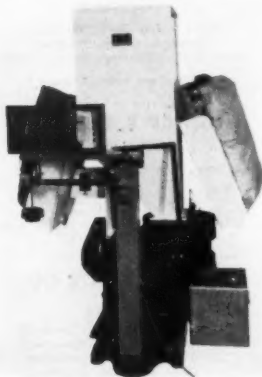
Super seal is a coal tar compound especially designed as a surface treatment for bituminous pavements. It seals the pavement and gives it a smooth and lasting surface. It is especially desirable for driveways, play-grounds, tennis courts, gas stations and airports. Considerable additional information is available from Troyer Driveway Service, 2157 South Park Ave., Buffalo, N. Y., or by using the coupon.

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There are a lot of interesting features in this new dry feeder. It will hold two 100-lb. bags or one 125-lb. drum carton, reducing the frequency

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In operation five minutes after it arrives on the job, according to the manufacturer, this mobile unit will "rebores" up to 1,000 feet in each direction from a manhole. It operates by a power driven rod, fed from a reel. The proper size cleaning head is attached to the rod and this is driven through the sewer with a boring action, cutting away roots, sediment and even scale. A booklet "Now Rebores Sewers" is available, telling how the work is done. Write National Power Rodding Corp., 4600 West Madison St., Chicago 44, Ill., or use the coupon.

Use coupon on page 109; circle No. 6-7

Root Remover and Preventive Keeps Roots Out of Sewers

This chemical, which does not contain lye, caustics or acids, is said to kill even large roots that are not actually submerged in the sewers, as well as those roots that are. In the case of unsubmerged roots, the hair roots extending into the liquid absorb enough chemical to destroy the main root. Fungus and slime are also destroyed. Periodic treatment is necessary to prevent new roots from entering the line, but roots once treated are said to be eliminated permanently. Semi-annual dosing is usually desirable where roots are a problem. Trees or shrubs are not affected by the chemical, the action being confined to the exposed roots alone. Full data from Hercules Chemical Co., 332 Canal St., New York, N. Y., or by using the coupon.

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Front End Shovel on Track-Type Tractor

With the engine mounted on the rear of the tractor, this new tractor-shovel has many advantages. It provides maximum balance and sta-



Track-type front end shovel

bility; and it gives the operator full visibility. There are 4 forward and 4 reverse speeds. Bucket capacity is 1 yard. The tractor has 67 hp, with either gasoline or diesel engine. Full data from Frank G. Hough Co., 867 Seventh Ave., Libertyville, Ill., or by using the coupon.

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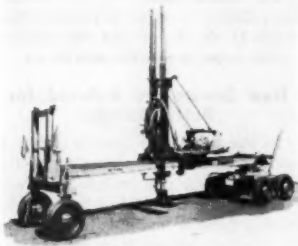
backhoe which uses the same boom, the same stick and the same one-man operation, providing full-circle swing for handling water, sewer or

other pipe, hydrants, etc., up to 2½ tons. The backhoe can be used for trenching, then converted in 5 minutes to a crane for laying the pipe. Good folder available. Write Schield Bantam Co., Waverly, Iowa, or use the coupon.

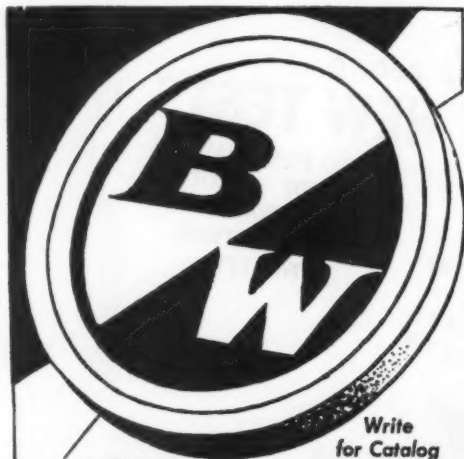
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sloping banks of a canal. It will span and tamp a trench 15 ft. wide and tamp to 15 ft. deep. Operation is by air motor. Better ask for fuller information as there are many features of this unit not describable in this limited space. Write R.P.B., Corp., 2751 E. 11th St., Los Angeles 23, Calif., or use the coupon.

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Large Stone to Small in One Operation

This crusher will accept quarry run rock up to 50 ins. long and reduce it to specification size material in one operation. Capacity is 250 tons an hour of minus 2½-inch and 125 tons an hour of minus 1-inch. Ratio of reduction is 32-1 to 40-1. Power required is 125 to 150 hp. This crusher is of the impact breaker type. Full information on it (3240 PMCO Impact Master) from Pettibone Mulliken Corp., 4700 West Division St., Chicago 51, Ill., or by using the coupon.

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The Pitman Hydraulic Crane

Handling up to 6,000 pounds, this hydraulic truck-mounted crane has many features of advantage for



Mighty handy for lifting

municipal work. Swing is 180°; pipe or other materials can be unloaded directly from the truck bed on which the crane is mounted. With the crane 10° below horizontal, it can be used for a straightline pull. Boom is adjustable from 11 to 20 ft. in length. Mounting requires only 35 ins. of truck bed space. Total weight is 2700 pounds. More information from Pitman Mfg. Co., 300 West 79th Terrace, Kansas City, Mo., or by using the coupon.

Use coupon on page 109; circle No. 6-14

Small Size High Lift Tractor Loader

The Mighty Mouse tractor is now available with a high-lift front end loader. The new M-6 has a 2-speed transmission, and its small size and ability to maneuver makes it valuable in many labor-saving ways. It will handle dirt, cinders and sand; load skips of mixers and small trucks; level; ditch; and backfill trenches. It is also designed to use a hammer knife mower, a rotary broom, a tote wagon, a rotary tiller and other tools. Full data from Mead Specialties Co., 4114 Knox Ave., Chicago 41, Ill., or use coupon.

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New-Type Materials Handling Loader

A new wheel tractor type loader with a hydraulic torque converter drive and a new clutch type transmission weighs 10,650 pounds and has a ¾-yd. bucket, hydraulically controlled. The bucket is placed over the drive wheels to provide best traction and maneuverability. Mounting is on rubber. This is the TL-10 Tracto-Loader. Full data from Tractomotive Corp., Deerfield, Ill., or by using the coupon.

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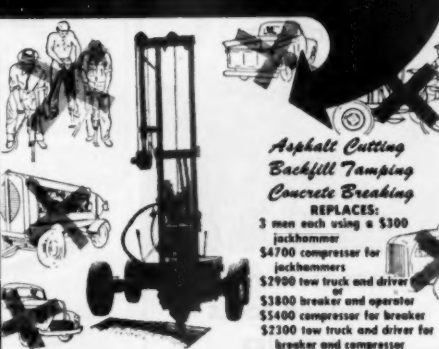
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Use coupon on page 109; circle No. 6-17

Light Variable Weight Tandem Roller

It is possible to transport this 3 to 5-ton tandem by towing behind a truck, since the complete roller is raised from the ground and supported by auxiliary rubber-tired wheels. Total metal weight is 7,650 pounds; total ballasted weight is 11,150 pounds. Motor is 25 hp, gasoline. There are two speeds for both forward and reverse. Compression roll is 48 ins. diameter and 42 ins. wide; 2-section steering roll is 30 ins. diameter and 40 ins. wide. For technical specifications and fuller data write Galion Iron Works & Mfg. Co., Galion, O., or use the coupon.

Use coupon on page 109; circle No. 6-18

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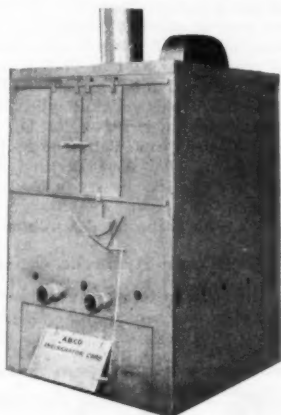
PUBLIC WORKS for June, 1951

height of 23 ft. and a capacity of 1500 pounds on a 15-ft. radius without stabilizers. It is power operated, either by takeoff or independent engine, and is hydraulic, without drums, clutches or brakes. More data from Badger Machine Co., Winona, Minn., or by using the coupon.

Use coupon on page 109; circle No. 6-19

Gas Fired Refuse Incinerator for Buildings

It is claimed that this automatic gas fired incinerator will completely consume wet or dry garbage. Two



Destroys garbage.

models are available, with 7 and 15 bushel capacities. The unit may be installed, as a furnace is installed, for disposal of garbage and refuse within a building. More information from ABCo Incinerator Corp., Cleveland, Ohio or by using the coupon.

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A new self-priming deep well pump, this unit is installed below the water level; no suction line, jets, rods or shafts are required. It is water cooled, and water lubricated. It is designed to deliver unusually

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high capacities at settings in excess of 70 ft. with well diameters of 4 ins. and larger. A nice bulletin describes this pump. Write Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago 5, Ill., or use the coupon.

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Use coupon on page 109; circle No. 6-22

PERSONAL NEWS

Carlton S. Proctor has been nominated for president of the American Society of Civil Engineers in 1952. A consulting engineer, with

offices in New York, Mr. Proctor has a long record of service to the Society. During the war, he held the rank of colonel and commanded the 334th Engineers in the Persian Gulf Command.

Marc V. Sullivan has joined the staff of Hitchcock & Estabrook, Inc., consulting engineers and architects, Minneapolis. He will divide his time between the Minneapolis and Menominee, Mich., offices of the firm.

Hill and Hill, consulting engineers, have moved to 8 Gibson Sts., North East, Pa., where additional space is available for their many services.

Dr. Karl R. Kennison, consulting civil and hydraulic engineer, has been appointed a lecturer in civil and sanitary engineering at the Massachusetts Institute of Technology.

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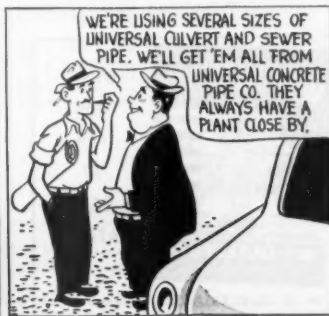
R. E. McDonnell has retired from active participation in the engineering firm of Burns & McDonnell after 53 years of service. The personnel of the firm gave a dinner and presented a commemorative plaque to Mr. McDonnell on April 3. During the 53 years, the firm has acted as consultant to 887 cities.

ASSOCIATIONS

The American Public Works Association will hold its annual convention at Detroit, Mich., Sept. 16 to 19. Conferences will be held at the Veterans Memorial Building.

The 24th Conference of the Maryland-Delaware Water and Sewerage Association will be held at Ocean City, Md., May 17 and 18. W. McLean Bingley, 2411 No. Charles St., Baltimore 18, Md., is Secretary.

The 1951 meeting of the Florida Section of the AWWA will be held jointly with the Florida Sewage and Industrial Wastes Association at Daytona Beach, Fla., Oct. 29, 30 and 31. Joe Williamson, Jr., Russell & Axon, Box 1431, Daytona Beach, Fla., is chairman of the Publicity Committee, and can tell of the many advantages of coming to Florida.



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63. Engineering specifications for use of Hexseal rubber gaskets with reinforced concrete sewer pipe are contained in a new brochure, published by Universal Concrete Pipe Co., Dept. PW, 297 S. High St., Columbus, Ohio. Subjects include dimensions, pipe design, reinforcement, curing and jointing instructions. Get your copy by checking the coupon.

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164. A new presentation, written especially for municipal officials, offers a modern solution for the garbage disposal problem. Be sure you have this up-to-date information on the elimination of city garbage collection by the use of Hotpoint Disposal units. Check the coupon now. Hotpoint Disposal Department, 5600 West Taylor St., Chicago 44, Ill.

An Incinerator Necessity

215. Recupercators featuring individual replacement of the heat transfer elements (silicon carbide tubes) for maximum accessibility and efficiency are described and illustrated in Bulletin 14 issued by Fitch Recuperator Co., Dept. PW, Plainfield Nat'l Bank Bldg., Plainfield, N. J.

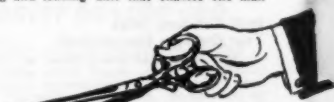
Save Garbage Collection In Defense Housing

232. Defense housing projects won't drain manpower garbage collection when Westinghouse Waste-Away Food Waste Disposers are installed in each kitchen. Helpful information for community planners is offered by Westinghouse Electric Corp., Electric Appliance Div., Mansfield, Ohio. Just check the coupon.

CONSTRUCTION EQUIPMENT

Your Dump Truck As a Complete Working Unit

39. The addition of a Holmes-Owen Loader to your dump truck converts it into a complete digging and loading unit that enables one man



to load, haul and dump. Illustrated folder shows how this self-loading unit with hydraulic crowding action can be a real time and labor saver for the municipality or contractor. Check the handy coupon for full data. Ernest Holmes Co., Chattanooga, Tenn.

Building State, County and Township Roads

47. The story of better roads for fewer taxpayers' dollars is told in an excellent bulletin describing "Caterpillar" diesel motor graders. These versatile units serve state, county and township bodies all year long on construction, maintenance and snow removal. Get bulletin D831 from Caterpillar Tractor Co., Peoria, Ill.

How to Keep Your Loader On the Job

50. Don't take more time to move your loader to the job than to do the work. Investigate the Eagle Truck Mounted Loader for handling gravel, sand, cinders, snow from windrows or piles. Get forms 444 and 947 from Eagle Crusher Co., Inc., Dept. PW 651, Galion, Ohio.

Municipalities Make Equipment Dollars Go Further

55. Be sure to get your copy of "Saving Facts" a new illustrated booklet prepared by The Oliver Corp. that shows how equipment dollars can be stretched on municipal work. Text and photos describe the application of tractors and money-saving attachments in street maintenance, snow removal, waste disposal, pipe laying and other projects. Write The Oliver Corp., Industrial Div., 19300 Euclid Ave., Cleveland 17, Ohio.

Check Your Power Needs Without Delay

68. International Harvester Company has available a new folder describing its line of diesel engines and power units for all your power needs up to 180 hp. For a copy of this colorful booklet, write to International Harvester Co., 180 N. Michigan Ave., Chicago 1, Ill., and ask for Form A-256-NN, or use the handy coupon and we will forward your request.

Tractors for Counties, Cities and Contractors

76. An attractive 24-page catalog portrays the Allis-Chalmers IID-5 crawler's abundant capacity and ability to meet the variable needs of counties, townships and contractors. Photographs and cutaway views illustrate its rugged construction and simplified maintenance. Use coupon or write Allis-Chalmers Mfg. Co., Tractor Division, Milwaukee 1, Wis.

Drill Concrete With Your Ordinary Electric Drill

82. Substantial cost-per-hole savings are claimed for Tilden Rotary Drills which penetrate concrete 2" to 4" per minute. Cutters can be resharpened. Available in sizes 1/2" to 4". Get full data from Tilden Tool Mfg. Co., 209 Los Molinos, San Clemente, Calif.

Grading Can Be Faster, Cheaper and Easier

96. You'll like every feature of the Austin-Western 9911 Grader. It has all-wheel drive, all-wheel steer, controlled traction, precision sideshift and a high lift, extreme reach, reversible blade. Get data from Austin-Western Co., Aurora, Ill.

Special Pumps to Fit Any Dewatering Job

101. Centrifugal Pumps. Long lasting, self-priming, non-clogging pumps for quickly dewatering trenches and similar construction jobs. Ask for Bulletin 7-LW-13. Gorman-Rupp Co., 320 No. Bowman St., Mansfield, Ohio.

Helpful Booklet on Carryable Centrifugal Pumps

129. A booklet prepared to give practical information that will guide you in choosing the best type of pump for your requirements is offered by the Homelite Corp. Both gasoline and electric models are discussed, and requirements outlined for many applications. Just check the coupon for your copy. The Homelite Corp., 2106 Riverside Ave., Port Chester, N. Y.

Combination Overhead and Front-End Shovel

194. The "Lodover", described in Bulletin LO 200, is a combination overhead and front-end shovel for International T-9 and TD-9 tractors.

By digging in front, swinging load overhead and dumping to the rear, extra yards are handled every hour. Regular front-end loading is not impeded in any way. Service Supply Corporation, 2004 Erie Ave., Philadelphia 32, Pa. Check handy coupon.

Helpful "How To Use" Section Aids Roller Selection

195. In addition to specification and illustrations of roller operation, the new Buffalo Springfield catalog features a special section to help in the selection of the right roller model for the job. Be sure you get top results from your roller selection by checking this helpful material. Use the coupon for a copy. Buffalo Springfield Roller Co., Springfield, Ohio.

For Fast Work on Post Driving, Pavement Breaking

251. The Ottawa Hydra-Hammer is a multi-purpose tool, ready to save time on pavement breaking, patch removal, post driving and pulling. Hydraulic power handles 400-lb. hammer, gives operator perfect control. Tons behind any car or truck. Ottawa Steel Products, Inc., Ottawa, Kans. Check coupon for full details.

Gunitite Costs Less On Repair Jobs

255. Be sure to investigate Gunitite for repair of reservoirs, dams, water and sewage plant tanks, sewers, swimming pools, etc. Contact Eastern Gunitite Co., Elkins Park, Pa. for full information, or use coupon.

Data Books on Portable and Tandem Rollers

276. Three bulletins, Nos. 295, 305 and 325 will give you complete data on the Galion line of portable and tandem rollers. Study these for your best roller buy. Check coupon for copies or write Galion Iron Works & Mfg. Co., Galion, Ohio.

CIVIL DEFENSE

Air Cooled Engines for Hundreds of Applications

137. Tested under severest conditions of long, hard use, these engines have earned world wide recognition as the "right" power for hundreds of applications. Get latest bulletin from Dept. PW, Briggs and Stratton Corp., Milwaukee 1, Wis.

Protection Against Power Failure

169. Data on stationary, portable, and standby electric plants, AC and DC, are offered by D. W. Oran & Sons, Inc., 7653 University Ave., Minneapolis 5, Minn. Several bulletins cover diesel and gasoline-driven plants for every purpose. Just check the coupon for your copies.

Technical Consulting Service On 2-Way Radio Systems

218. Civil Defense communications by mobile 2-way radio are a vital part of your plans. Helpful technical consulting service is offered by Motorola, C & E Div., 4545 Augusta Blvd., Chicago 51, Ill. Check the coupon now.

Civil Defense Communication Advisory Service

263. A free brochure designed to help your community with civil defense communications is available now from General Electric. Every civil defense official should have a copy. Order yours today by using handy coupon, or write Dept. PW, General Electric Co., Section 1041, Electronics Park, Syracuse, N. Y.

SEWERAGE AND WASTE TREATMENT

What You Should Know About Trickling Filter Underdrains

20. Specifications for vitrified clay underdrain blocks conforming to ASTM standards, suggestions for layout and construction of trickling filter floors, dimensions of standard blocks, channel covers, angles and other fittings are available from the Trickling Filter Floor Institute, 327 Fifth Ave., Pittsburgh 22, Pa. Check the coupon and we will forward your request.

How to Keep Trenching Jobs on Schedule

24. The easy maneuverability of the tough, compact Cleveland Model 95 "Baby Digger" makes it well suited for the difficult job of trenching past the many obstacles of city

and suburban work. Multiple digging and crawler speeds handle all soil types and trench widths up to 24". Get Bulletin S-52 from Cleveland Trencher Co., 20100 St. Clair Ave., Cleveland 17, Ohio.

A Handbook of Sewer Cleaning Equipment and Methods

46. A new, fully illustrated 40-page booklet shows every sewer cleaning operation with "Flexible" tools. Includes data on the fast and easily operated new Sewer Rods and full engineers' specifications for power bucket machines. For your copy write Flexible Sewer Rod Equipment Co., 9059 Venice Blvd., Los Angeles 34, Calif.

Engineering Data on Digester Heating

52. An excellent 32-page bulletin covering all features of the PET External Heater and Heat Exchanger unit discusses effective digester heating, size of heater and exchanger, space requirements, building heating, and related items. Curves and tables provide full data for the designer. Check the coupon for your copy of this comprehensive bulletin, No. 235. Pacific Flush-Tank Co., 4241 Ravenswood Ave., Chicago 13, Ill.

How You Can Dispose Of Sewage Solids

54. Nichols Herreshoff incinerator for complete disposal of sewage solids and industrial wastes—a new booklet illustrates and explains how this Nichols incinerator works. Pictures recent installations. Write Dept. PW, Nichols Engineering and Research Corp., 70 Pine St., New York 5, N. Y.

All Electric Floatless Liquid Level Control

78. Description of operating principles and applications of B/W controls shows the simplicity and many uses of these all-electric, floatless devices. Diagrams of typical installations and engineering data all in bulletin 147 issued by B/W Controller Corp., Dept. PW, 2224 E. Maple Rd., Birmingham, Mich.

How Cities Can Do Complete Sewer Cleaning From Street

90. Literature illustrating how cities, towns and villages using OK Champion Sewer Cleaners are doing a complete sewer cleaning job from street level. Power machines available in addition to full line of sewer rods and accessories. Issued by Champion Corporation, 4752 Sheffield Avenue, Hammond, Indiana.

Need Low-Cost Air For Sewage Treatment?

122. New 20-page booklet shows operating and construction features of Rotary Positive Blowers engineered to fit your needs. Air for activated sludge, water treatment, constant vacuum for filtering. Bulletin 22-23-B-13 gives details. Roots-Connorsville Blower Corp., 510 Poplar Ave., Connorsville, Ind.

Low Cost Power From Dual Fuel Engines

154. Operating on the Diesel cycle, burning either oil or gas, the Worthington Supercharged Dual Fuel Diesels give high economies by running on the cheapest fuel available. Get complete data from Worthington Pump & Machinery Corp., Dept. PW, Harrison, N. J.

Data on New Single Stage Sludge Digestion Unit

163. High capacity mixing and ample gas storage space are provided in the new single stage digester type MA. Bulletin No. 6591 describes the unit and tells how it works. Photographs, drawings and useful tables of sizes and design data are included. Unit is available for tanks from 29 to 50 foot diameters. The Dorr Co., Barry Pl., Stamford, Conn.

Data on Scum Removal For Primary Tanks

172. Send for Bulletin S 6000 published by Inflico Inc., for all the interesting facts concerning the automatic hydraulic scum removal from primary sewage sedimentation tanks by controlled currents. The same bulletin furnishes complete information on sedimentation and sludge removal. Write Inflico Inc., Box 5033, Tucson, Ariz., or use coupon.

Air for Activated Sludge and Other Aeration Processes

187. Quiet operation, high efficiency and compact size are features of the Chicago "Standardaire" positive displacement blower. Wide range of capacities available to fit your needs. Details and performance data from Chicago Pump Co., 2348 Wolfram Ave., Chicago 18, Ill.

Complete Catalog for Engineers Shows Water and Sewage Plant Equipment

191. The complete line of Jeffrey equipment for treatment of water, sewage and industrial wastes is covered in 52-page Catalog 833. Detailed information is provided on bar screens, grinders, grit collectors, "jigrit" washers, sludge collectors, feeders, conveyors and other related units. Photos and drawings of installations plus capacity tables complete this valuable booklet. Use coupon or write Jeffrey Mfg. Co., 947 N. 4th St., Columbus 16, Ohio.

Data on Design of Grit Collectors and Washers

202. Grit collection and separation of organic materials from settled grit is described in Link-Belt Bulletin 1942. Typical installations are shown, and design data is provided, together with specifications. Use coupon for copy, or write Link-Belt Co., 2045 W. Hunting Park Ave., Philadelphia 40, Pa.

Tractor-Mounted Backhoe Simplifies Digging Operations

238. Be sure to investigate the new Henry Backhoe to cut digging costs on laterals, footings, septic tanks, graves. Easily attached to your tractor. Get full data from Henry Mfg. Co., Dept. PW-651, Box 720, Topeka, Kansas, by using coupon.

How Sewer Departments Clean Catch Basins Faster

245. Cities using Hydrocranes for catch basin cleaning report better, faster, cleaner jobs. Additional excavation jobs keep these versatile units busy. Send for full data today by using coupon. Bucyrus-Erie Hydrocrane Div., Ss. Milwaukee, Wis.

General Catalog on Measuring and Controlling Equipment

272. The full line of Simplex equipment for the measurement and control of liquids and gases in water and sewage plant installations is illustrated and described in detail in 28-page Catalog 002. Every engineer should study the design data in this helpful booklet. Write Simplex Valve & Meter Co., 68th & Upland Sts., Philadelphia 42, Pa., or use the coupon.

Slide Rule For Drainage Calculations

275. Calculating the right size and shape of Armo Drainage structures is much easier with a slide rule calculator offered by Armo Drainage and Metal Products, Inc., Middletown, Ohio. Get one right away by checking the handy coupon.

How to Dispose of Sewage and Industrial Sludges

281. Get full information on the C. E. Raymond System of combined incineration and sludge drying providing high temperature deodorizing for nuisance-free sludge disposal. Flexible layouts fit large and small communities. Use handy coupon or write Combustion Engineering-Superheater, Inc., Flash Dryer Div., 1315 No. Branch St., Chicago 22, Ill.

STREETS AND HIGHWAYS

How the Mobil-Sweeper Can Improve Street Sweeping

33. Sweeping costs can be cut with the new Mobil-Sweeper which features safe highway speeds up to 55 mph, carries 2 2/3 cu. yd. dirt hopper, sweeps swath up to 10' wide with full floating brooms. Hills and deep gutters are no obstacle. Write to The Conveyor Co., 3260 E. Slauson Ave., Los Angeles 58, Calif. or use coupon for complete details on this machine.

Levels Sidewalks and Curbs Quickly and Easily

29. How the Mud-Jack Method for raising concrete curbs, gutter, walls and streets solves problems of that kind quickly and economically without the usual cost of time-consuming reconstruction activities—a new bulletin by Koehring Company, 3026 W. Concordia Ave., Milwaukee 10, Wis.

Get Data Now On This Catch Basin Cleaner

34. Simple powerful pneumatic bucket is featured by Netco Catch Basin Cleaner. Folder 33A gives details and illustrates operation of

complete self powered truck mounted unit. Netco Div., Clark-Wilcox Co., 118 Western Ave., Boston 34, Mass.

Do You Have Complete Black Top Equipment Data?

41. In 36-page catalog AA a full line of equipment for black top road construction and maintenance is covered. Units described and illustrated include several models of pressure distributors, supply tanks, sprayers, brooms, asphalt kettles, portable rollers, and accessory tools. Use coupon for copy of this handy manual. Littleford Bros., 452 E. Pearl St., Cincinnati 2, Ohio.

Helpful Data on Distributors For Bituminous Materials

104. Two models of pressure distributors featuring uniform pressure and temperature, accurate displacement pumping and fast loading are covered in Bulletins RS 31549 and RS

12046, available from Standard Steel Works, Dept. PW, North Kansas City, Mo. Check the coupon to request your copies.

How to Beat The Weed Problem

66. Be sure to investigate weed control with selective chemical weed killers that get roots and all. Send in coupon today for bulletins on Dolge products that will rid roadsides, parks and lawns of the weed nuisance. C. B. Dolge Co., Dept. PW, Westport, Conn.

Latest Bulletins on the Hough "Payloador"

187. Carrying dirt and backfill, loading snow, grading and bulldozing are a few of the many jobs quickly handled by public works departments that use Hough, "Payloadors". Several models having bucket sizes from 12 cu. ft. to 1 1/2 cu. yds. are offered. Check them all to see which is best suited for your job. The Frank G. Hough Co., 709 Sunnyside Ave., Libertyville, Ill.

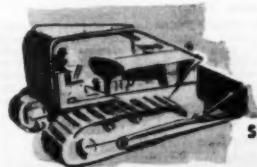
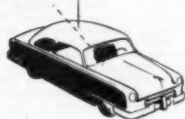
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Pipe Phones (AquaPhone)... **\$3.70**

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How to Save Time on Curb and Gutter Work

143. Every type of curb and gutter work is illustrated in the 12-page Heltzel catalog on steel forms for building concrete curbs, gutters and sidewalks. Time-saving setups show how to speed up the job and save money. Get your copy from Heltzel Steel Form & Iron Co., Dept., P.W., Warren, Ohio.

Road Widening With Concrete, Bituminous Mix or Gravel

149. All types of road building materials are handled quickly and accurately by Aspeco Wideners. New illustrated bulletin shows operations on all types of widening strips, gives details on wideners and trench rollers. Issued by All Purpose Spreader Co., Elyria, Ohio.

Black-Top Paver Offers Many Advantages

150. The flexible Admunt Black Top Paver lays any asphalt mix, hot or cold, in widths from 6 ft. to 13 ft. Careful design lowers operating cost and cuts maintenance. Attachments spread stone, cinders or slag. Get full data on this machine by checking coupon. The Foote Co., 1954 State St., Nunda, N. Y.

Versatile Maintainer Has Year 'Round Usefulness

151. A new bulletin shows how the sturdy Huber Maintainer will work for you the year 'round on maintenance jobs, berm leveling, road planing, bull-dozing, snow plowing, brooming, mowing shoulders and as a patch roller. Good ideas on how to do all these jobs in Bulletin No. M-138. Write Huber Manufacturing Co., Dept. P.W., Marion, Ohio.

Your Property is Worth Good Protection

176. When installing link fence you want protection against rust and corrosion as well as vandalism. Investigate chain link fence made of "Konik" metal described in "Planned Protection" published by Continental Steel Corp., Kokomo, Ind.

WATER WORKS

Water Level Controls for Sewage and Water Plants

31. Dependable float-operated pump and motorized valve controls for single or multiple pump installations are described in bulletins issued by the Water Level Controls Div., Healy-Ruff Co., 719 Hampden Ave., St. Paul 4, Minn. All units feature splash proof construction, mercury tube switches.

The Modern, Streamlined Elevated Tank

32. A new 8-page bulletin describes the Watersphere, a modern elevated water tank of welded steel construction for general service gravity water pressure and fire protection. Construction details, illustrations of typical installations and table of standard sizes from 25,000 to 250,000 gallons capacity are included. Check the coupon. Chicago Bridge & Iron Co., 2115 McCormick Bldg., Chicago 4, Ill.

Is Your City Metered 100%

33. 100% metering as practiced by many cities requires accurate, dependable meters with interchangeable parts. Cut-away views of every part, capacity and size data are all included in handsome American-Niagara water meter booklet available from Buffalo Meter Co., 2920 Main St., Buffalo 14, N. Y.

Engineering Data on Diatomite Filters

44. Detailed information and typical plans of Sparkler diatomite filters for swimming pools of municipal water systems is available to engineers and municipal officials. These filters feature self-cleaning filter elements which cut wash water to a minimum. Get this material now by using coupon. Sparkler Manufacturing Co., Mundelein, Ill.

Now You Can Actually See Your Chlorine Residual

79. By using the Wallace & Tiernan residual chlorine recorder you can get better chlorination control because you actually see at all times the residual being carried. The 24-

hour charts provide a valuable record and check on operating irregularities. More data on what the recorder is and what it does are covered in Bulletin M-20-S. Wallace & Tiernan, Dept. P.W., Newark 1, N. J.

Factors to Consider in Elevated Tank Selection

80. An interesting discussion of the factors to be considered for selection of elevated capacities and sizes, required fire flows and other useful data are included in a bulletin on elevated water storage published by Pittsburgh-Des Moines Steel Co., Neville Island P. O., Pittsburgh 25, Pa.

Do You Have Data on Asbestos Yarning Rope?

87. Easily handled asbestos yarning rope will not contaminate water; links tightly in joint to form base for all types of sealing compounds. A new bulletin describes the plain, rubber-coated and copper-jacketed styles available and provides data for determining size and amount needed for standard pipe joints. Check coupon for your copy. Johns-Manville, 22 E. 40th St., New York 16, N. Y.

Painting Water Tanks For Longer Protection

94. High labor costs demand special consideration when painting elevated water tanks. This and other factors involved in proper paint selection are discussed in a bulletin issued by Jos. Dixon Crucible Co., Dept. 6 P, Jersey City 3, N. J. Helpful specifications for repainting water tanks are also included.

Pressure Pipe That Retains Capacity

106. Several bulletins describing the construction of pressure pipe, lists of installations, carrying capacity tests, making service connections under pressure; and detail descriptions of several installations. Lock Joint Pipe Co., Box 269, East Orange, N. J.

Specs for Gate Valves

112. Rigidly inspected gate valves for pressures up to 175 lbs. by R. D. Wood Co. Sizes 2" to 30"; for any standard type joint. R. D. Wood Co., Public Ledger Bldg., Philadelphia 5, Pa.

Your Laboratory Needs Reliable Equipment

123. Laboratory apparatus and chemicals; incubators, microscopes, pH meters, water stills, stirrers, turbidimeters, etc. can be obtained from any of the lab branches of the Harshaw Scientific Div. of the Harshaw Chemical Co., Cleveland 6, Ohio. Use the coupon to get your catalog covering full line of water and sewage plant laboratory supplies.

All About Cement-Mortar Lining of Water Mains

133. Here, in a really beautiful booklet, is practically everything you need to know about this method of lining mains in place—the needs, methods, and results that will interest you. Centrifuge Corp., Dept. P.W., 140 Cedar St., New York 6, N. Y.

Helpful Data on Mechanical Joints

139. Get Circular 49 from M & H Valve & Fittings Co. for important information and installation dimensions of M & H AWWA Mechanical Joint Valves and Hydrants. Features include ease of installation, construction economy, long life. Use coupon or write M & H Valve & Fittings Co., Anniston, Ala.

Easily Cleaned, Long Run Filter Bed Media

140. Bulletins on Anthracite tell the reasons why selected, graded crushed anthracite is superior to sand as a filtering material. Have you made a full investigation? Write Anthracite Equipment Corp., Wilkes-Barre, Pa.

Complete Equipment for The Complete Pool

157. Latest equipment for recirculation, filtration, chlorination, softening and pH control are described in Permit Bulletin No. 2157. Manual and automatic valves explained and many installations diagrammed. Complete specifications given. Permutit Co., 350 West 42nd St., New York 18, N. Y.

Rehabilitation for Your Water System

132. Whether your water supply system requires a complete rehabilitation program including an engineering survey, hydraulic analysis, reconditioning and related construction, or merely pipe cleaning and coating, it is wise to plan your campaign without delay. Get full data now on the requirements to put your system in top condition. Write Pittsburgh Pipe Cleaner Co., 133 Dahlem St., Pittsburgh 6, Pa., or check handy coupon.

Helpful Data on Corporation Stops

161. A complete line of brass goods for water works: corporation stops, curb stops, service pipe couplings, goosenecks and other fittings are illustrated and described in catalog W-39, issued by A. Y. McDonald Mfg. Co., Dubuque, Iowa. Get your copy for ready reference.

Handy Catalog Covers All Pipe Repairs

167. A complete catalog covering repair clamps, packings and gaskets of several designs to suit all needs is offered by the Smith-Blair Co. Directions for use show ease of application. Every water works needs a copy of this catalog for ready reference. Available by using coupon or writing Smith-Blair, Inc., 535 Rail-road Ave., So. San Francisco, Calif.

Helpful Data on Well Water Systems

173. A comprehensive, 48-page book on Layne Water Well Systems covers gravel well wells, underreaming, cemented walls, rock wells and other well types. Applications of shutter screens and vertical turbine pumps are shown, together with water treatment and conditioning equipment. Ten pages are devoted to useful engineering tables and measurement data. Check the coupon today or write Layne & Bowler, Inc., Dept. FW, Memphis 8, Tenn.

Precision Chemical Pump For Hypochlorination

181. Bulletin PM-11 describes the Model AP Precision chemical pump for accurate feeding of hypochlorites or other corrosive liquids used in water treatment. Applications include hypochlorination for swimming pools, camps, hotels and small municipal supplies where chemical feed is from 1 to 20 gallons per day. Precision Machine Co., 5 Union Sq., Somerville 43, Mass.

Engineering Data On Mechanical Joint C.I. Pipe

183. General specification, weights and dimensions of mechanical joint cast iron pipe and fittings are furnished in a 32-page booklet issued by Alabama Pipe Co., Anniston, Ala. Get this helpful data by checking coupon.

Does Your Water Works Have Standby Power?

224. Dependable Climax power plants are ready for emergency service to insure fire protection, and can also save power costs by peak load operation. Use the coupon for full data on Climax, 40 to 495 HP, operating on sewage or natural gas, butane or gasoline. Climax Engine & Pump Mfg. Co., 208 So. La Salle St., Chicago 3, Ill.

Investigate This Compact Flow Meter for Water

226. The Foster "Flow Tube" is a new metering element that is compact and easy to install. Bulletin FT illustrates simple element containing nozzles for differential pressure production and shows capacity range and accuracy. Made in standard type sizes. Foster Engineering Co., Union, N. J. will send copy, or use coupon.

All About Centrifugal Pumps

258. Where pumping performance counts you want to check your specifications carefully. Investigate the features of Fairbanks-Morse centrifugals. Use coupon or write to Fairbanks, Morse & Co., Dept. PW, Chicago 5, Ill.

Standard Specifications for C. I. Pipe and Fittings

278. Standard dimensions for cast iron water pipe and special castings are available in a convenient booklet offered with the compliments of S. Pipe and Foundry Co., Burlington, N. J. Get your copy by checking the coupon.

Learn About Alkalinity Control With Blended Softened Waters

236. A new 8-page bulletin (No. 5037) is available which offers a clear description of alkalinity control by blending sodium and hydrogen zeolite softened waters, and shows the advantages of this treatment for industrial and municipal applications. Included are flow diagrams and discussion of the chemical reactions. Use coupon for your copy. General Filter Co., 923 Second St., Ames, Iowa.

Automatic Pump Control For Your Water System

239. In Bulletin 230-G4, Builders-Providence outlines the "Pressureless Control" system which is said to save on first cost by providing ground level storage in residential areas; permit unattended operation of outlying stations; furnish instantaneous response to meet fire flow. Flow diagrams and typical applications are included. Mail coupon to check this versatile system. Builders-Providence, Inc., Providence 1, R. I.

Corrosion Protection For Water Works

266. Steel pipe lines, elevated tanks, treatment plant equipment and all other steel structures subject to rust, tuberculation and attack by aggressive soils can be protected by long-lasting Bitumastic enamels. Send for bulletins today so that you can specify the right coating for your job. Use coupon or write Koppers Co., Tar Products Div., Dept. 555T, Pittsburgh 19, Pa.

Precise pH Control And Water Tests

117. A new 12-page catalog No. 600-10 illustrates and describes the Hellige Colorimetric Comparator line equipped with Non-Fading Glass Color Standards. The catalog also introduces the Hellige Daylight Comparator Illuminator for determinations in both artificial and day light. Write to Hellige, Inc., Dept. PW, 3718 Northern Blvd., Long Island City 1, N. Y., or use coupon.

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CONTINENTAL FENCE

Peace-Of-Mind PROPERTY PROTECTION

Enjoy the peace-of-mind protection you get with Continental fence. . . the only fence made of KONIK steel. KONIK is an open hearth alloy steel with copper, nickel, and chromium added for extra strength and extra resistance to rust and corrosion. Write Continental or see our nearest representative for complete information on Continental fence.

*Due to present National Defense requirements for nickel and chromium, two critical war materials, Continental fence will not be available in "Konik" steel for the duration of this emergency.

*Trade Mks Reg. U.S. Pat. Off.

CONTINENTAL STEEL CORPORATION
Kokomo, Indiana

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CONTINENTAL STEEL CORPORATION

WORTH TELLING...



by Arthur K.
Akers

★ Highlights to us of the Miami A.W.W.A. meeting: 1906 registered, not counting those who "crawled under the tent." . . . Col. Rockwell's party on the lawn of his Miami Beach mansion . . . Frank Lovejoy's stimulating talk at the Manufacturers Association luncheon . . . Growing number of young men in the ranks of the water superintendents—including Bob Simms of Spartanburg, S. C., of course!

★ Now another old friend in the water works manufacturers' ranks goes up: Hector P. Boncher, recently elected vice president of Dresser Manufacturing Division, at Bradford, Pa.



Mr. Boncher



Mr. Strickland

★ D. M. Strickland goes from vice president to president and general manager of National Clay Pipe Manufacturers Association, vice W. E. Robinson.

★ Eugene A. Hardin, widely known for his activities in water works and sewerage planning for the cities of Philadelphia and Detroit, is now a staff member of Parsons, Brinckerhoff, Hall, and MacDonald, New York consulting engineers.

★ B. M. Powell is now assistant advertising manager of Caterpillar Tractor Company at Peoria, Ill., following transfer of P. C. Smith, assistant advertising manager, to the eastern sales division.

★ Lawrence K. Cecil is promoted from sales manager to vice president of Inflico Inc., recently removed to Tuscon, Arizona.

★ Neptune Meter Company, New York, has elected Dante E. Broggi president, succeeding John H. Ballantine, now chairman of the board.

★ H. Vance Crawford was honored by his friends and his General Electric Company associates with a testimonial dinner upon his retirement in Schenectady on June 7. In addition to gifts, he received a scroll containing a part of the names of his thousands of friends in this field. Paper shortages cut it a bit short.

★ Like PUBLIC WORKS, we consider the Saturday Evening POST a fine advertising medium. In a series of color ads in it, Allis-Chalmers Tractor Division has set out to "produce a public clamor for improved highways." In their PUBLIC WORKS ads, they then tell how to turn this clamor into better highways with their equipment.

★ C. W. Michaels has been appointed supervisor of Market Research for the General Electric Company's commercial equipment division at Syracuse, including two-way radio.

★ Speaking again of tractors, there was this want ad in a Kansas paper: Young farmer wants to meet a marriageable girl with tractor. Please send picture of the tractor.

★ Theodore R. Colville has moved up to management of all advertising and sales promotion in the four divisions of Byron Jackson Company, Los Angeles.



Mr. Colville

★ Rome Grader Division of Union Fork and Hoe Company of Rome, N. Y. has just been purchased by Pettibone Mulliken Corporation, Chicago. Manufacture and sales of graders will be conducted in and from both cities now.

● A drunk walked into an open elevator shaft, fell four floors to the bottom, stood up, brushed himself off, and shouted "I said UP!"—The Kablegram.

"Specials" are a Specialty of LOCK JOINT...

FLANGED OUTLET IN
FULL LENGTH PIPE

LOCK JOINT 90° ELBOW

LOCK JOINT TEE

BEVELED SPIGOT
ON FULL LENGTH PIPE

Elbows, wyes, tees, crosses, outlets, manholes, reducers, bevels, adaptors... any special pipe you require is available in standard Lock Joint design. And if standard specials won't do the job, "special" specials may be designed to individual specifications. Lock Joint Concrete Pressure Pipe can be connected swiftly and efficiently to any standard water pipe of other material. All specials are engineered with the same care and high safety factor that have made Lock Joint the pipe of unexcelled durability and dependability.

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LOCK JOINT PIPE COMPANY

Est. 1905

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Wichita, Kan. • Kenilworth, N. J. • Hartford, Conn. • Tucumcari, N. Mex.
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SCOPE OF SERVICES—Lock Joint Pipe Company specializes in the manufacture and installation of Reinforced Concrete Pressure Pipe for Water Supply and Distribution Mains in a wide range of diameters as well as Concrete Pipes of all types for Sanitary Sewers, Storm Drains, Culverts and Subaqueous Lines.



HEADACHES YOU CAN AVOID

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Chlorination—the modern aid to sewage treatment—has proven its ability to overcome many sewage treatment “headaches” in hundreds of plants all over the country.

To mention only a few—chlorination controls odors at Fort Wayne, Indiana; reduces filter ponding at Rotterdam, New York; and sterilizes the effluent of the Easterly Sewage Plant in Cleveland, Ohio.

Results? Here's a typical statement from Mr. Ralph Hood, Superintendent at Fort Wayne, Ohio: “We have been most thankful for our auto-

matic chlorine control equipment. It has done its job well.”

Chlorination engineered by Wallace & Tiernan can help *your* plant, too. Best of all the cost generally averages less than 1% of initial plant investment. This low cost, coupled with the savings and increased plant efficiency made possible by effective chlorination, makes it a buy dollar-wise purchasers can't afford to overlook.

Put this modern aid to sewage treatment to work in *your* plant. A call to your nearest Wallace & Tiernan Representative brings all the details.

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